144—11

TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1891.

No. 165.

THE ANSONIA BRASS AND COPPER COMPANY, APPELLANT,

vs.

THE ELECTRICAL SUPPLY COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF CONNECTICUT.

FILED OCTOBER 8, 1888.

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1 Circuit Court of the United States for the District of Connecticut.

ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

Be it remembered that on the 21st day of August, 1888, in open court, being a day of the same term at which the final decree was made and entered in said cause, the following appeal and bond was filed, viz:

In the Circuit Court of the United States, District of Connecticut.
In Equity.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

And now, August 21st, 1888, the said defendant, by Joshua Pusey, of counsel, comes into court and prays an appeal to the Supreme Court of the United States from the final judgment and decree in the above-entitled cause.

Which appeal is allowed and security ordered in the sum of five hundred dollars.

N. SHIPMAN,
District Judge.

2 In the Circuit Court of the United States in and for the District of Connecticut, in the Second Circuit.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

Know all men by these presents that we, The Ansonia Brass and Copper Company, complainant, and Charles A. Cowles, of Ansonia, Connecticut, and Robert Hoadley, of Ansonia, Connecticut, as sureties, are held and firmly bound unto the above-named The Electrical Supply Company in the sum of five hundred dollars, to be paid to the said The Electrical Supply Company, their certain attorney, executors, administrators, or assigns; to which payment, well and truly to be made, we bind ourselves, our respective heirs, executors, and administrators, jointly and severally, by these presents.

Sealed with our seals and dated this 21st day of August, A. D. 1888.

Whereas lately, at a circuit court of the United States in and for the district of Connecticut, in the second circuit, in a suit depending in the said court between the said The Ansonia Brass and Copper Company, as complainant, and the said The Electrical Supply Company, as defendant, a final decree was rendered against the said The

Ansonia Brass and Copper Company on the — day of ——, A. D. 1888, for the sum of — dollars, for costs, and dismissing the bill of complaint, and the said The Ansonia Brass and Copper Company having taken an appeal, — has been allowed by the said circuit court, to the Supreme Court of the United States to reverse the said decree in the aforesaid suit:

3 Now, the condition of this obligation is such that if the said The Ansonia Brass and Copper Company shall prosecute its said appeal to effect and answer all damages and costs if it fail to make its appeal good, then this obligation to be null and void; otherwise to remain in full force and virtue.

THE ANSONIA BRASS AND COPPER COMPANY,
Per A. COWLES, *Vice-President.*
CHARLES A. COWLES.
R. HOADLEY.

Sealed and delivered in the presence of—
ADOLPH W. KING,
EDWARD O. GOODRICH.
HOWARD P. GOODWIN.

Approved:
N. SHIPMAN,
District Judge.

Satisfactory:
M. W. SEYMOUR,
Att'y for the Defendant.

4 Be it remembered that on the 9th day of August, 1884, there was filed in court a bill in equity in the words and figures following, viz:

United States Circuit Court, District of Connecticut.

THE ANSONIA BRASS AND COPPER COMPANY *against* THE ELECTRICAL SUPPLY COMPANY. } In Equity.

To the honorable the judges of the circuit court for the district of Connecticut, sitting in chancery:

The Ansonia Brass and Copper Company, a corporation organized according to the laws of the State of Connecticut and located and doing business in the town of Derby, county of New Haven, in said State, and a citizen of said State of Connecticut, brings this its bill of complaint against the Electrical Supply Company, a corporation organized according to the laws of said State of Connecticut and located in said town of Derby, in said county and State, and a citizen of said State.

And thereupon your orator complains and says:

1st. That heretofore and before the 10th day of November, A. D.

1882, Alfred A. Cowles, of the city and State of New York, was the first and original inventor of a certain new and useful improvement in insulated electric conductors, fully described in the letters patent hereinafter mentioned, and which had not been known or used before his invention and discovery thereof, and which was not for more than two years prior to the time of his application for a patent therefor, as hereinafter mentioned, in public use or on sale in this country or elsewhere.

2d. And your orator further shows unto your honors that the said Alfred A. Cowles, being as aforesaid the first and original inventor and discoverer of said improvement and invention and being a citizen of the United States, did on the 20th day of February, A. D. 1883, upon due application therefor, obtain letters patent of the United States, signed by the acting Secretary of the Interior and countersigned by the Commissioner of Patents of the United States, bearing date the day and year last aforesaid, whereby there was granted and secured unto the said Alfred A. Cowles, his heirs and assigns, or intended so to be for the term of seventeen years from and after the date of said letters patent the full and exclusive right to make, construct and use, and vend to others to be used the said invention as set forth in said letters patent, which were dated February 20th, 1883, and were numbered 272,660, by virtue whereof the said Alfred A. Cowles became the sole owner of all the rights and privileges granted and secured or intended to be granted and secured in and by said letters patent.

3d. And your orator further represents and shows that on the 17th day of April, A. D. 1883, the said Alfred A. Cowles sold, assigned, and set over unto your orator, The Ansonia Brass and Copper Company, by assignment in writing bearing date on that day, all his right, title, and interest in said invention as secured to him by said letters patent and all right and interest in said letters patent; which said assignment was duly recorded in the Patent Office of the United States on the 21st day of July, A. D. 1883; to which
6 said assignment, ready to be produced in court as your honors may direct, and to said record thereof your orator begs leave to refer.

4th. And your orator further shows unto your honors that by virtue of the premises it now is and at all times since the making and delivery of said assignment of said letters patent has been the sole and exclusive owner of said letters patent No. 272,660 and of the invention and improvement described and specified therein and of all the rights and privileges granted and secured thereby; that said rights and privileges are of great value to your orator; that since the granting of said letters patent and the assignment as aforesaid of the same your orator has invested and expended large sums of money and has been at great trouble and expense in and about the said invention for the purpose of carrying on the business of the manufacture and sale of said insulated electric conductors made under said letters patent and of making the same profitable to themselves and useful to the public; that a large amount of said "insulated electric conductor wire" is made and sold and that your orator

is entitled to all the profits from such sales; that the public have general knowledge and have acquiesced in the aforesaid rights of your orator, and that your orator believes that it will realize and receive large gains and profits therefrom if infringements by the above-named defendant and its confederates shall be prevented.

5th. And your orator further shows unto your honors and charges upon information and belief that said defendant, well knowing the premises and the rights secured to your orator as aforesaid, but contriving to injure your orator and defraud it of the advantages which might and otherwise would come and accrue to it from said invention and improvement in said "insulated electric conductor," after the issuing and assignment of said letters patent and invention as aforesaid and before the commencement of this suit did, as your orator is informed and believes, without the license or allow-
7 ance of and against the will of your orator and in violation of the rights of your orator and in infringement of said letters patent, unlawfully and wrongfully and in defiance of the rights of your orator, did make, use, and vend to others to be used the said invention and did make and use and vend to others to be used insulated electric conductor wire and insulated electric conductors according to and employing and containing said invention described and claimed in said letters patent, and that said defendant still continues so to do, and threatens and intends to make the aforesaid "insulated electric conductor" in large quantities, and to supply the market therewith and to sell the same, thereby decreasing the sales of said patented article manufactured by your orator, in defiance of the right secured to your orator as aforesaid and to the great and irreparable loss and injury of your orator, and by which your orator has been and is still being deprived of great gains and profits which your orator might and would otherwise have obtained and which have been received and enjoyed by said defendant by and through its aforesaid unlawful acts and doings.

6th. That said defendant has made and sold large quantities of said "insulated electric conductors" made according to the method specified in said letters patent, and has a large quantity on hand which it is offering for sale, and said defendant has made and realized large profits and advantages therefrom, but to what extent such sales have been made and how large the gain and profits to the defendant your orator has not definite knowledge and therefore prays a discovery thereof.

7th. Your orator further says that the use of said invention by said defendant, and its preparation and avowed determination to continue the same, and their other unlawful acts in utter disregard and defiance of the rights of your orator, has had and still has the
8 effect to encourage and does encourage and induce others to venture to infringe said patent and disregard the rights of your orator.

8th. Your orator further shows that it has caused notice to be given to the defendant of said infringement and of the rights of your orator in the premises, and requested it to desist and refrain from said infringement, but that said defendant has disregarded said

notice and has refused to desist from said infringement, and still continues to make and sell said patented article, by reason whereof your orator has been greatly injured, all of which acts and doings are against equity and good conscience and tend to the manifest wrong and injury of your orator in the premises.

9th. In consideration whereof and forasmuch as your orator can only have adequate relief in a court of equity, where matters of this nature are properly cognizable, to the end, therefore, that the said defendant may, if it can, show why your orator should not have the relief hereby prayed, and that the said defendant and its officers and agents may upon oath, to the best and utmost of its and their knowledge, information, remembrance, and belief, full, true, and perfect answers make hereto and to the several interrogatories hereinafter mentioned and set forth, as they are required to answer—that is to say:

(*a*) Whether letters patent were not issued to said Alfred A. Cowles as herein set forth.

(*b*) Whether said letters patent and the invention therein described were not assigned, sold, and set over to your orator, the said The Ansonia Brass and Copper Company, as hereinbefore set forth.

(*c*) Whether said defendant and its officers, directors, and agents have not had notice of the issue and assignment of said invention and letters patent to your orator and full notice of the right of your orator.

9 (*d*) Whether said defendant has not, since the assignment of said letters patent to the plaintiff and since said defendant has full notice that your orator owned said letters patent at said town of Derby, in said State of Connecticut, and within the jurisdiction of this court, practiced said invention and improvement and manufactured and made said "insulated electrical conductor" according to the process and method specified in said letters patent and pursuant to the invention described therein, and whether it has not manufactured and sold in said town of Derby, and sold elsewhere in the State of Connecticut and in the State of New York, said "insulated electrical conductor" without license or authority from your orator or any other person.

(*e*) What quantity and amount of said "insulated electrical conductor" made in accordance with said invention said defendant has so made according to said process, and what quantity of said "insulated electrical conductor" embodying or containing said invention said defendant has sold since the date of said assignment, and what profits said defendant has made or derived therefrom from the use and practice of said invention.

10th. And your orator further prays that said defendant, said The Electrical Supply Company, and its officers, servants, and agents, may be restrained by a writ of injunction issuing out of and under the seal of this honorable court from making and selling any "insulated electrical conductor" made according to the process described in said letters patent or involving or embodying the invention described in said letters patent, and from selling or exposing for sale any "insulated electrical conductor" the exclusive right to

make, use, or vend which is secured to your orator as aforesaid, and from in any way using or putting in practice the device for manufacturing or using the process of manufacturing said conductor wire secured by said letters patent, and from all violations and infringements of the exclusive rights of your orator under
10 and by virtue of said letters patent, and that on the final hearing of this cause the said injunction may be made perpetual.

11th. And, further, that said defendant may be decreed to account to your orator for all profits realized by said defendant from the use or practice of said invention or improvement covered by said letters patent or from the manufacture or sale of said "insulated electrical conductor" made pursuant to said invention as secured by said letters patent, in violation of the exclusive rights of your orator, and that said defendant may be decreed and ordered to pay to your orator all damages that it has or shall suffer by reason of said infringement and wrongful acts of the defendant, and that your orator may have such other and further relief in the premises as the nature of the case may require and as may be according to equity and good conscience, and that the defendant may be enjoined during the pendency of this suit from such infringement.

12th. That damages to the amount of twenty-five thousand dollars may be assessed, as by the statute is in such cases provided, and that the same may be adjudged to your orator against the defendant for such violation of its exclusive right and for said infringement.

13th. That the defendant may be decreed to pay the costs of this suit.

14th. May it please your honors to grant to this complainant, your orator—

1st. A writ of subpœna in due and usual form and under the usual penalties, directed to the defendant, The Electrical Supply Company.

2d. A writ of injunction restraining it from such infringement during the pendency of this suit, as also all its clerks, servants, agents, attorneys, confederates, and workmen.

11 3d. And such other and further relief as equity may require and to your honors may seem meet.

THE ANSONIA BRASS AND COPPER CO.
A. A. COWLES, *Sec'y.*

Dated at New York this sixth day of August, A. D. 1884.

STATE OF NEW YORK, }
County of New York, Southern District of New York, } *ss:*

Alfred A. Cowles, secretary of the complainant corporation, being duly sworn, deposes and says that he is the secretary of the complainant corporation herein, and that he has read the foregoing bill of complaint subscribed by him and knows the contents thereof, and that the same is true of his own knowledge except as to such mat-

ters and things as are therein stated on information and belief, and all such matters and things he verily believes to be true.

That this deponent is the inventor in said letters patent, and that he verily believes himself to have been the original inventor of the improvement and invention therein described and claimed in said letters patent, and that the same had not been known or used before the invention and discovery thereof by himself.

ALFRED A. COWLES.

Sworn to and subscribed before me this sixth day of August, A. D. 1884.

J. M. BELDEN,
Notary Public, Kings Co.

Certificate filed in New York Co.

And on the same day a writ of subpœna issued out of court, directed to the said respondent, which was duly served and returned, and which, with the return of service endorsed thereon, is in the words and figures following, viz:

12 The President of the United States of America to the marshal of the district of Connecticut sendeth greeting:

You are hereby commanded to summon The Electrical Supply Company, a corporation organized according to the laws of [SEAL.] said State of Connecticut and located in the town of Derby, in the county of New Haven and State of Connecticut, and a citizen of said State, to appear before the judges of the circuit court of the United States of America for the district of Connecticut, in the second circuit, in equity, on the first Monday of September, 1884, wheresoever the said court shall then be, to answer a bill of complaint exhibited against said The Electrical Supply Company in said court by The Ansonia Brass and Copper Company, a corporation organized according to the laws of the State of Connecticut and located and doing business in the town of Derby, county of New Haven, in said State, and then and there to answer the same, and to do and abide by what said court may order and decree in the premises.

Make due service and return at least twenty days before said first Monday of September, 1884.

Witness the Hon. Morrison R. Waite, Chief Justice of the Supreme Court of the United States, at Hartford, this 9th day of August, A. D. 1884.

E. E. MARVIN, *Clerk.*

The defendant is required to enter its appearance in said cause in the clerk's office of said court on or before the day at which this writ is returnable, or, by the rules of said court, said bill will be taken as confessed.

E. E. MARVIN, *Clerk.*

WOOSTER, TORRANCE & GAGER,
Complainant's Solicitor-, Birmingham, Conn.

[Endorsed:] No. 455. United States circuit court, district of Connecticut. In Equity. The Ansonia Brass & Copper Co. against The Electrical Supply Co. Writ of subpœna. Issued August 9th, 1884; returnable September rule day, 1884.

UNITED STATES OF AMERICA.
District of Connecticut, New Haven County, } *ss:*

ANSONIA, *Aug. 11th*, 1884.

Then and there I served the within writ on The Electrical Supply Company, the defendants herein named, by delivering to and leaving with J. B. Wallace, the secretary of said company, at his usual place of abode, a true and attested copy hereof.

Attest: J. C. KINNEY.

Fees:

Service	2 00
Copy	50
Travel, 106	6 36
2 endorsements	20
Carriage	50
	$9 56

13 And on the same day Messrs. Wooster, Torrance & Gager appeared for the complainant, and on the 26th day of August, 1884, Messrs. Seymour & Seymour appeared for the defendant, and on the 6th day of October, 1884, defendant's answer was filed in the words and figures following, viz:

Circuit Court of the United States, District of Connecticut. In Equity.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

Answer.

The defendant, saving and reserving unto itself all and all manner of objections that may or can be had or taken to the many errors, uncertainties, imperfections, and insufficiencies in the complainant's bill of complaint contained, for answer thereto or unto so much and such parts thereof as it is informed it is material or necessary for it to make answer unto, says:

This defendant is informed that letters patent of the United States were on the 20th day of February, A. D. 1883, granted to Alfred A. Cowles, of the city, county, and State of New York, and num-
11 bered 272,660, for a certain alleged improvement in insulated electrical conductors, but this defendant denies, as alleged in said bill of complaint, that he, the said Cowles, was the original and first inventor of said alleged improvement, and denies that the same

was not known or used before his, the said Cowles', patented invention and for more than two yerrs prior to his, the said Cowles', application for letters patent therefor.

This defendant is not informed save by said bill of complaint whether the said letters patent were assigned to the complainant as therein charged, and leaves the complainant to prove the same as he may be advised.

The defendant does not know and cannot, therefore, answer whether the complainant has been in the exclusive ownership of said invention since his alleged title to the same accrued, or whether it has invested large sums of money in developing the business of manufacturing insulated electric wires under said supposed letters patent, as stated in said bill of complaint, and it does not admit that the public has acquiesced in the validity of said letters patent, and denies all equity on the part of complainant to any right to realize or receive gains or profits based upon any supposed authority or title to any invention pretendedly set forth in said letters patent.

And this defendant avers that long prior to the supposed invention of the said Alfred A. Cowles as set forth in said letters patent No. 272,660, dated February 20th, 1883, and long before his
15 application for said letters patent it was well known that wires for electric conductors could be insulated by means of fibrous jackets charged with insulating material of various kinds, including the employment of mineral paint; that such wires could be provided with a series of jackets of fibrous material, and that such jackets, both when laid upon the wire, could be saturated with protecting and insulating substances, as well as that such insulating substances or material could be applied to the first jackets after the same had been placed upon the conducting wires.

And this defendant avers that substantially the same method specified in said letters patent so granted to said Cowles of insulating electric conductors and rendering the coating substantially non-combustible as well as insulated, consisting in applying a layer of fibrous material, a layer of some insulating and non-combustible substance, and a second layer of fibrous material upon such insulating or non-combustible substance or material while the same was in a green condition or before such insulating and protecting substance or material has dried or set, has been for many years, to wit, ten (10) years, before the application of the said Alfred A. Cowles for his said letters patent a part of the common knowledge of mankind and commonly practiced in the art of protecting and insulating wires, etc., for conducting electric currents and for other useful purposes in the arts. Wherefore this defendant avers and will show to
this honorable court that the said letters patent granted to
16 the said Cowles, dated and numbered as aforesaid, does not and, in view of the knowledge of the art of insulating and protecting wire known prior to said supposed invention, cannot contain any patentable novelty and does not exhibit any subject of invention such as is pretendedly contained in the specification of said letters patent and specified in the first and second claims thereof; and this defendant, in support of this allegation of the want of pat-

entable invention contained in said letters patent, will, in addition to the various other facts which it will prove as known to the prior art, rely upon the hereinafter next named letters patent, all of prior date to the supposed invention of the said Cowles, to wit:

English patents granted to William Thomas Henley and Henry George Forster, No. 12236, Aug. 10th, 1848.

Edward Highton, Feb. 7th, 1850, No. 12959.

William Brown and William Williams, Mar. 7th, 1850, No. 12991.

Henry Vernon Physick, Nov. 17th, 1852, No. 778.

William Gilpin, April 5th, 1854, No. 779.

Pier Alberto Balestoini, Sept. 8th, 1855, No. 2039.

Pier Alberto Balestoini, Sept. 11th, 1856, No. 2124.

George Bedson, Jan. 15th, 1857, No. 129.

Felix Masie Baudouin, April 3d, 1857, No. 933.

Josiah Latimar Clark, Frederick Braithwaite, and Geo. Edward Preece, Aug. 30th, 1858, No. 1965.

Charles William Siemens, Sept. 30th, 1858, No. 2180.

Joseph Rogers, Oct. 2d, 1858, No. 2192.

17 Walter Hall and Arthur Welles, Oct. 28th, 1858, No. 2411.

Walter Hancock, Nov. 19, 1858, No. 2616.

John Henry Johnson, Nov. 19th, 1858, No. 2626.

John Wallace Duncan, Dec. 30th, 1858, No. 2997.

Andrew Barclay, Feb. 4th, 1859, No. 329.

William H. Horstmann, Feb. 16th, 1859, No. 434.

William Warne, John Americus Fanshaw, James Archibald Jaques, and Thomas Galpin, Mar. 21st, 1859, No. 716.

William Simnock, April 14th, 1859, No. 942.

John Chatterton and Willoughby Smith, Aug. 25th, 1860, No. 2056.

William Edward Newton, Nov. 1st, 1860, No. 2674.

John Branscombe, Feb. 8th, 1861, No. 322.

John Chatterton and Willoughby Smith, Jan. 22d, 1861, No. 175.

James Benjamin Harby, Jan. 29th, 1862, No. 236.

Charles William Siemens, Feb. 20th, 1863, No. 464.

William Thomas Henley, May 4th, 1864, No. 1126.

Alfred Fauvine Jaloureau and Charles Louis Lardy, Oct. 19th, 1867, No. 2942.

Matthew Gray, Feb. 20th, 1869, No. 531.

Henry Brooks, Adam Brooks, Thomas Bestwick, and William Bestwick, Feb. 7th, 1870, No. 344.

Matthew Gray and Frederick Hawkins, Aug. 29th, 1870, No. 2367.

Joseph Rogers, Dec. 19th, 1870, No. 3314.

18 Christian Ludwig Madsen, Dec. 18th, 1873, No. 4167.

George Frederick James, Mar. 31st, 1880, No. 1333.

Samuel Joseph Mackay, June 11th, 1881, No. 2542.

George West Royston Piggott, Jan. 30th, 1872, No. 286.

John Wallace Duncan, April 14th, 1853, No. 906.

United States Patent.

Alfred Fauvine Jaloureau, June 23d, 1868, No. 79126.

And this defendant, further answering, says that the said supposed invention set forth in said letters patent granted to the said Cowles and dated and numbered as aforesaid, or a substantial and material part thereof, was, prior to the said supposed invention of the said Cowles, substantially described, exhibited, and made known in the following-named letters patent and publications, all of prior date to the alleged invention of the said Cowles, to wit:

English patents granted to—

William Thomas Henley and Henry George Forster, Aug. 10th, 1848, No. 12236.

Edward Highton, Feb. 7th, 1850, No. 12959.

William Brown and William Williams, Mar. 7th, 1850, No. 12991.

Henry Vernon Physick, Nov. 17th, 1852, No. 778.

William Gilpin, April 5th, 1854, No. 779.

Pier Alberto Balestoini, Sept. 8th, 1855, No. 2039.

Pier Alberto Balestoini, Sept. 11th, 1856, No. 2124.

George Bedson, Jan. 15th, 1857, No. 129.

19 Felix Marie Baudouin, April 3d, 1857, No. 932.

Josiah Latimer Clark, Frederick Braithwaite, and Geo. Edward Preece, Aug. 38th, 1858, No. 1965.

Charles William Siemens, Sept. 30th, 1858, No. 2180.

Joseph Rogers, Oct., 1858, No. 2192.

Walter Hall and Arthur Welles, Oct. 28th, 1858, No. 2411.

Walter Hancock, Nov. 19th, 1858, No. 2616.

John Henry Johnson, Nov. 19th, 1858, No. 2026.

John Wallace Duncan, Dec. 30th, 1858, No. 2997.

Andrew Barclay, Feb. 4th, 1859, No. 329.

William H. Horstmann, Feb. 16th, 1859, No. 434.

William Warne, John Americus Fanshaw, James Archibald Jaques, and Thomas Galpin, Mar. 21st, 1859, No. 716.

William Sinnock, April 14th, 1859, No. 942.

John Chatterton and Willoughby Smith, Aug. 25th, 1860, No. 2056.

William Edward Newton, Nov. 1st, 1860, No. 2674.

John Branscombe, Feb. 8th, 1861, No. 322.

John Chatterton and Willoughby Smith, Jan. 22d, 1861, No. 175.

James Benjamin Harby, Jan. 29th, 1862, No. 236.

Charles William Siemens, Feb. 20th, 1863, No. 464.

William Thomas Henley, May 4th, 1864, No. 1126.

Alfred Fauvine Jaloureau and Charles Louis Lardy, Oct. 19th, 1867, No. 2942.

Matthew Gray, Feb. 20th, 1869, No. 531.

20 Henry Brooks, Adam Brooks, Thomas Bestwick, and William Bestwick, Feb. 7th, 1870, No. 344.

Matthew Gray and Frederick Hawkins, Aug. 29th, 1870, No. 2367.

Joseph Rogers, Dec. 19th, 1870, No. 3314.

Christian Ludwig Madsen, Dec. 18th, 1873, No. 4167.

George Frederick James, Mar. 31st, 1880, No. 1338.
Samuel Joseph Mackay, June 11th, 1881, No. 2542.
George West Royston Piggott, Jan. 30th, 1872, No. 286.
John Wallace Duncan, April 14th, 1853, No. 906.

United States Patent.

Alfred Fauvine Jalourcau, June 23d, 1868, No. 29126.

And the defendant, for further answer, says that the said invention set forth in the said letters patent granted to said Cowles and dated and numbered as aforesaid was before the said supposed invention of the said Cowles known to and publicly used and practiced by the following-named persons, whose names and residences and the place where such knowledge or use was had are hereinafter next set forth:

Name.	Residence.	Place of use.
Thomas L. Reed	Providence, R. I.	Providence, R. I.
Eugene T. Philips	Providence, R. I.	Providence, R. I.
Edwin Holmes	New York city	New York city.

And to various other individuals who are at present known to this defendant, but whose names, residence, and place of
21 using said supposed invention it begs leave to insert herein by way of amendment when to it known.

And this defendant admits that it is manufacturing and selling insulated wire, as it has the lawful right to do, and it denies that the complainant has any right or equity whatsoever by reason of the ownership of said letters patent or otherwise to interfere with or to restrain the business of the said defendant, and it denies that it is infringing upon any lawful right or title under said letters patent which the said complainant can or ought to have.

And this defendant, in answer to the several interrogatories in said bill of complaint set forth or to so much of the same as it is advised that it is necessary or material that he should answer, — as follows:

To the first (*a*) it answers "yes."

To the second (*b*) it answers "that it is not advised except by said bill of complaint, and cannot therefore answer the same of its own knowledge."

To the third (*c*) it answers "that it has received a notice of the issuance and the assignment of said letters patent of said Cowles to the complainant, but that it has no knowledge of any right of the complainant in or to or growing out of the same."

To the fourth (*d*) it answers that since said notice it has manufactured and made insulated electrical conductors according to the patented process or method pretendedly described in said letters patent of said Cowles in said town of Derby, and sold the
22 same in the States of New York and Connecticut without the license or authority of the complainant or any other person, as it clearly had a right to do, as the said Cowles was neither the inventor or discoverer of said process or method and had not the right

to license or authorize or to empower others to license or authorize others to manufacture and to sell the same.

In regard to the fifth (*e*) interrogatory, this defendant submits to this honorable court that it is not bound to answer the same, and declines to make answer thereto until ordered so to do by this honorable court.

And the defendant, for further answer, denies every allegation of said bill of complaint not herein expressly admitted, and it denies any and all infringements of any kind whatsoever of any legal or equitable rights of the complainant herein, and denies that the complainant has in its bill of complaint shown any case entitling it to proceed against this defendant in this honorable court and prays the same benefit of the facts and matters herein set forth as if it had demurred to said bill.

And this defendant, for further answer, submits to this honorable court that said complainant has no right to any further answer to said bill or any part thereof than is above given, and has no right to any injunction, account, or other relief prayed for in said bill.

And this defendant, for further answer, says that it denies all and all manner of wrongful and unlawful acts wherewith it is by
23 said bill of complaint charged; without this, that there is any other matter, cause, or thing in said bill of complaint contained material or necessary for this defendant to make answer unto, and not herein and hereby well and sufficiently answered, confessed, traversed, and avoided or denied, is true, to the knowledge or belief of this defendant; all which matters and things this defendant is ready and willing to aver, maintain, and prove as this honorable court shall direct, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

THE ELECTRICAL SUPPLY COMPANY,
By THOS. WALLACE, JR.,
Agent and Attorney in-Fact.

MORRIS W. SEYMOUR,
Solicitor, &c., for Defendants.

Subscribed and sworn to before me this 6th day of Oct., A. D. 1884.

[SEAL.] RICHARD C. AMBLER,
Notary Public.

And on the 2d day of May, 1887, complainant's replication to said answer was filed in the words and figures following, viz:

24 Circuit Court of the U. S., District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY, Complainant,
against
THE ELECTRICAL SUPPLY COMPANY, Defendant.

The replication of The Ansonia Brass and Copper Company to the answer of The Electrical Supply Company, defendant.

This repliant, saving and reserving to itself now and at all times

hereafter all and all manner of benefits and advantage of exception which may be had or taken to the manifold insufficiencies of the said plea, for replication thereunto says that it will aver, maintain, and prove its declaration to be true, certain, and sufficient in the law, and that the said answer of The Electrical Supply Company, defendant, is uncertain, untrue, and insufficient to be replied unto by this repliant; that any other matter or thing whatsoever in the said plea contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed and avoided, traversed or denied, is true; all which matters and things this repliant is and will be ready to aver, maintain, and prove as this honorable court shall direct, and humbly pray as in and by *his* said declaration *as he* has already prayed.

THE ANSONIA BRASS & COPPER COMPANY,
By WM. B. WOOSTER, *Attorney.*

25 And on the 8th day of June, 1887, complainant's and defendant's evidence was filed in the words and figures following, viz:

United States Circuit Court, District of Connecticut.

THE ANSONIA BRASS AND COPPER COMPANY
against
THE ELECTRIC SUPPLY COMPANY. } In Equity.

It is hereby stipulated and agreed that the testimony herein on either side may be taken before a notary public or U. S. commissioner with the same effect as if taken before one of the standing examiners of the court.

Proofs for complainant in the above-entitled suit for final hearing, taken before me, John Brice, a notary public for the county and State of New York, at New York city, September 26th, 1885.

Present: Wm. B. Wooster, Esq., solicitor for complainants, Ansonia Brass and Copper Company; Morris W. Seymour, Esq., solicitor for The Electrical Supply Company, defendant.

BENSON F. MARKS, having been first duly sworn, examined by Mr. WOOSTER, testifies as follows:

Direct examination:

1 Q. State your name, age, residence, and occupation.

A. My name is Benson F. Marks. I am thirty-three years
26 old; reside at Ansonia, Connecticut, and am foreman of the winding department in the works of the Ansonia Brass and Copper Company.

2 Q. State what the winding business is of which you are foreman. What do you wind, and for what purpose?

A. The object is winding cotton fibre on wire for electrical purposes.

3 Q. Have you ever been in the employ of the Electrical Supply Company in Ansonia?

A. Yes, sir.

4 Q. State when you entered in the employment of that company, when you ceased your employment with that company, and what was your employment while thus employed.

A. I entered their employ December 1st, 1883. I left them in the latter part of August, 1885. I was employed in their winding department at their factory in Ansonia, Connecticut.

5 Q. Did you have access to the room in that factory where electrical wire was covered by braiding and paint?

A. Yes, sir.

6 Q. How frequently were you in that room during the time of your employment?

A. One or more times every working day while working there.

7 Q. Are you familiar and were you while in their employ familiar with their mode of covering copper wire by braiding fibrous material, if they did so, in connection with paint?

A. Yes, sir.

Mr. Wooster offers in evidence a certified copy of letters patent No. 272,660, dated February 20th, 1883, to Alfred A. Cowles for improvement in insulated electric conductors.

And it is stipulated that the complainant may take the same, and that the Patent Office copy of the printed specification, which
27 is hereby marked "Complainant's Exhibit Cowles Patent," may be used in this case as a substitute for said certified copy.

Mr. Wooster also offers in evidence a card with four pieces of insulated electric wire manufactured by the complainant, which is marked "Complainant's Exhibit Electric Wire."

8 Q. Please look at the sample of electric wire now shown to you and state how far it resembles the electric wire made in the factory of the defendants from the time you entered the employment of the defendant until you ceased such employment.

A. I should say that it looked very similar to the wire made by defendant. There is one peculiarity about it that convinces me that it was made by them, that it is not round. It is somewhat flat. I have noticed that same thing very often while there. It is caused by the pressure of the rolls after having been painted.

Mr. Wooster offers in evidence a piece of insulated wire shown to the witness and testified to by him in the last answer. The same is marked "Complainant's Exhibit Defendant's Manufactured Wire."

9 Q. If I correctly understand you, the piece of wire marked "Complainant's Exhibit Defendant's Manufactured Wire" correctly represents the painted electric wire made by the defendants from December, 1883, down to August, 1885, does it?

A. To the best of my knowledge it does.

10 Q. Please describe the method or process used in the defendant's factory during that time in making such wire.

A. The wire is run from a reel through the double braider. It receives its first braid on the lower compartment of the braider, then through a pan or tank of paint, then braided through the upper compartment. It is then taken from the braider, drawn
28 through a trough containing paint, put in the dry-room until almost dry, then run through a polishing machine.

11 Q. Are the two braiding heads or compartments and the paint vessel parts of one machine?

A. They are.

12 Q. How are they located? Perpendicularly, horizontally?

A. Perpendicularly; one above the other.

13 Q. How is the wire fed to the braiders in the machines used by the defendants?

A. It is drawn through by rolls at the top of the machine.

14 Q. Is that true of all the machines used by the defendants or are there exceptions?

A. There is one exception to my knowledge. There may be more.

15 Q. How is the wire fed to the braiders in that excepted machine?

A. It is forced through by rolls underneath the machine.

16 Q. Look at the drawings attached to the Complainant's Exhibit "Cowles Patent" and describe the difference between that drawing and the machines used by defendant (if any exist) with reference to the location of the paint reservoir and the feed-rolls with the other parts of the machine.

A. The paint reservoir in the defendant's machines was situated on the plate of the upper braider and below where the "carriers" or "travelers" put the cotton on the wire. The rolls are situated in about the same position indicated on the drawing, except in the excepted machine, which is fed by pushing, the rolls being situated at the bottom of the lower braider.

17 Q. Then, if I understand you, the paint reservoir in the defendant's machine through which the wire passed was located between the two braiders or rather between the two points where the thread is braided onto the wire by the "travellers," as in the drawing of the "Cowles patent"?

A. It was, between the two points where the cotton was braided on the wire.

29 Cross-examination by Mr. SEYMOUR, for defendant:

18 X Q. Do I understand you that up to last month you were in the employ of the defendant in this case?

A. Yes, sir.

19 X Q. And that you are now in the employ of the complainant?

A. Yes, sir.

20 X Q. What was your business and for whom did you work prior to December, 1883?

A. I was assistant foreman in the insulating department in the Western Electric Manufacturing Company, No. 62 New Church street, New York.

21 X Q. What work did you do while in the employ of the defendant?

A. I had charge of the winding machine; kept them in repair, and improved them wherever I saw an opportunity.

22 X Q. You mean the machines that you have described in your direct testimony?

A. No, sir.

23 X Q. It was not then your business to repair or improve or operate the machines you have described, was it?

A. It was not.

24 X Q. The winding business, then, in which you was engaged in the defendant's employment had nothing whatever to do with the insulating of electric conductors and rendering them substantially non-combustible by the applying of one or more layers of fibrous material?

A. It was connected indirectly with the braiding department, inasmuch as I wound some wires before it was sent to the braiding-room to be braided.

25 X Q. Do you mean that you placed the braid upon the naked wire, and that subsequently that wire so braided was sent to the braiding-room where it was put through the machine described in the "Complainant's Exhibit Cowles' Patent"?

A. No, sir; I put no braid on wire, but I wound the wire instead of braiding it.

30 26 X Q. And this work of yours was in a different room or part of the building from the one where the electric conductors were insulated, was it not?

A. Part of my work was in a different room, and part of it was in the same room. I will say the braiding department occupied one floor and part of another. My department occupied one floor and part of the floor occupied by the braiding.

27 X Q. It was no part of your business to run these braiders, was it?

A. It was not.

28 X Q. Did you ever see "Complainant's Exhibit Defendant's Manufactured Wire" before the beginning of this examination?

A. Not before to-day.

29 X Q. You do not, of your own knowledge, know where it came from?

A. I could not swear where it came from.

30 X Q. And the only peculiarity about it which convinces you that it was made by the defendant is that it is not round, but is somewhat flat. Is that what you wish to be understood as saying?

A. Yes; also, I have known them to use red cotton on the inside braid.

31 X Q. Are these the only reasons?

A. They are the only reasons I have for thinking it was manufactured by the defendant.

Redirect examination by Mr. WOOSTER:

32 Q. Have you read the specifications in and seen the drawings of "Cowles' patent"?

A. I have.

33 Q. State whether or not the method or process of manufacturing insulated electric wire and the product of manufacturing insulated wire by the defendants is the same as described in said specifications.

A. Yes, sir.

31 Last question and answer objected to by Mr. Seymour as calling for and being an expression of opinion on the part of the witness without laying proper foundation therefor.

Defendant's counsel admits and directs to be entered upon the record that said letters patent were duly assigned by the said Alfred A. Cowles on the 17th day of April, 1883, to the complainants as averred in the bill of complaint in this case, and that the same was duly recorded in the Patent Office of the United States on the 21st day of July, 1883.

Examination of Benson F. Marks closed.

BENSON F. MARKS.

Sworn to before me this 26th day of September, 1885.

JOHN BRICE,

[SEAL.] *Notary Public, New York County.*

THOMAS L. FOWLER, having been first duly sworn as a witness for the complainant, examined by Mr. WOOSTER, testifies as follows:

1 Q. What is your name, age, and occupation?

A. My name is Thomas L. Fowler. I am 31 years old. My occupation is salesman for the Ansonia Brass and Copper Company. I reside in Brooklyn.

2 Q. How long have you been employed by the Ansonia Brass and Copper Company as a salesman?

A. About 13 years.

3 Q. Say whether, in your capacity as salesman, you had occasion to know and have known what insulated electric wires for electric lighting purposes were for sale in the market.

A. Yes, sir.

32 4 Q. Are you familiar with the insulated and non-combustible electric conductors patented by Alfred A. Cowles in letters patent of February 20, 1883, represented by "Complainant's Exhibit Cowles Patent"?

A. Yes, sir.

5 Q. Say whether or not said conductor patented to Cowles has come into general use for electric lighting purposes.

A. Yes, sir; it has come into general use.

6 Q. What conductor, if any, was in general use for electric lighting purposes prior to that patented to Cowles, and how is it made?

A. A copper wire double covered with cotton and saturated with paraffine.

7 Q. Do you know whether the paraffine was applied cold or hot?

A. It was applied hot.

8 Q. And when was the paraffine applied with reference to the applying of the double-cotton covering?

A. It was applied after both coverings were put on the wire.

9 Q. After the introduction of the Cowles conductor what was the effect upon the paraffine conductor in the market?

A. The sale of the Cowles conductor almost entirely superseded the sale of the paraffine conductor for electric lighting purposes.

10 Q. If you have a sample of the old wire, double covered and saturated with hot paraffine, such as you have described, will you please produce the same.

A. I have such sample and herewith produce it.

Sample offered in evidence by Mr. Wooster, and the same is marked "Complainant's Exhibit Paraffine Wire."

Cross-examined by Mr. SEYMOUR, for defendant:

11 X Q. Have you ever personally been engaged in the manufacture of insulated electric wire for any purpose?

A. I have never manufactured any insulated electric wire
33 for any purpose, but I have been present at the factory of the Ansonia Brass and Copper Company, where electric conductors are made, and have witnessed the manner in which they are manufactured and the material used in their manufacture.

12 X Q. Your information, then, upon this subject is derived from the experience of the complainant corporation, is it not?

A. Yes; it is.

13 X Q. In your employment as salesman of electric wire your efforts have been confined, have they not, to selling the electric wire manufactured by the complainant corporation?

A. I have sold no electric conductor manufactured by any corporation or person other than the complainant.

14 X Q. And the same is true of the paraffine-covered wire of which you have spoken, is it not?

A. Yes; it is, and my previous answer covers that.

15 X Q. And your entire knowledge and experience in the matter about which you have been testifying has been confined to your employment by the complainant corporation and the sale of goods manufactured by it?

A. I cannot say that it has entirely, as I have always taken an interest in electric conductors manufactured by other houses, and have seen most of the different kinds of electric conductors made by them.

16 X Q. Did you ever try to sell the product of any other manufacturer?

A. No; I cannot say that I have tried to sell any electric conductors other than that manufactured by the complainant.

17 X Q. Do you mean to testify that no other conductor for elec-

tric lighting purposes was in use prior to Nov. 10th, 1882, except that described by you as "a copper wire, double covered with cotton and saturated with paraffine"?

A. I cannot say positively that there was not; but that was the one that was in general use prior to that date.

18 X Q. Do you mean to say that that was the one in general use prior to that date, or do you mean to say that that was the one manufactured by your concern?

34 A. As far as my recollection goes I think that that was the one in general use prior to the date of the Cowles patent.

Redirect examination by Mr. WOOSTER:

19 Q. In giving the time when the general use of the paraffine conductor began to give way to the use of the Cowles conductor have you had in mind specially the date of the Cowles patent or the time when the Cowles conductor was introduced?

A. I have had in mind the date at which the Cowles conductor was introduced and not the date of the patent.

20 Q. Please look at "Complainant's Exhibit Electric Wire" and say whether the four pieces of wire constituting said exhibit are of complainant's manufacture under the Cowles patent?

A. Yes, sir; they are.

THOMAS L. FOWLER.

Sworn to before me this 26th day of September, 1885.

JOHN BRICE,

[SEAL.] *Notary Public, New York County.*

35 EDGAR SCOTT, having been first duly sworn as a witness for the complainant, testifies as follows:

1 Q. What is your name, age, residence, and occupation?

A. My name is Edgar Scott; I am thirty-nine years old; reside at Mt. Vernon, New York; my occupation is assistant cashier with Holmes, Booth & Haydens.

2 Q. Say whether you have bought any electric conductor of the defendant, the Electrical Supply Company; and, if so, produce the same and say when you bought it.

A. I have; on the 26th day of September, 1885, seven pounds at twenty-five cents a pound, and here produce a specimen and portion of the identical wire so purchased.

3 Q. If you received a "cash bill" on purchasing said wire please produce the same.

A. I did, and here produce said "cash bill."

The portion of wire produced by the witness is offered in evidence by Mr. Wooster and marked "Complainant's Exhibit Defendant's Manufactured Electric Wire No. 2." "Cash bill" introduced in evidence by Mr. Wooster and marked "Complainant's Exhibit Cash Bill."

Cross-examination waived.

Testimony closed.

EDGAR SCOTT.

Sworn to before me this 26th day of September, 1885.

JOHN BRICE,

[SEAL.] *Notary Public, New York County.*

36 United States Circuit Court, District of Connecticut.

THE ANSONIA BRASS AND COPPER COMPANY
against
THE ELECTICAL SUPPLY COMPANY. } In Equity.

Proofs for final hearing on the part of complainants taken before me, George T. Pinckney, a notary public, by consent of parties and pursuant to notice under and pursuant to the 67th rule in Equity as amended.

NEW YORK, *Nov.* 29, 1886.

Present: Charles E. Mitchell, Esq., Joshua Pusey, Esq., of counsel for complainants; Morris W. Seymour, Esq., counsel for defendants.

LEMUEL W. SERRELL, a witness produced by and on behalf of the complainant, being duly affirmed, in answer to interrogatories propounded by JOSHUA PUSEY, Esq., of counsel for complainant, testifies as follows:

1 Q. Please state your name, age, residence, and occupation.

A. Lemuel W. Serrell; reside in Plainfield, New Jersey; am 57 years of age; am a solicitor of patents doing buisness at 140 Nassau street, New York city.

2 Q. What has been the extent of your experience as a solicitor of patents?

A. I have followed the business of solicitor of patents ever since I left school in about 1845, and I have obtained a very large number of patents, especially in connection with electrical appliances.

I have procured patents upon electric instruments, and for many years did most all of the patent business for the Western Union Telegraph Co. and the Gold and Stock Telegraph Co.

37 3 Q. Have you had occasions to examine into the construction and operation of mechanism and appliances relating to conductors of electricity and particularly relating to electric lighting, and are you familiar with the history and state of the art relating to these matters?

A. I have had occasion to make such examinations and am familiar with the state of the art in relation to electric conductors and machinery for making the same, and my information on that subject has been accumulated during the past twenty or twenty-five years, during which time I have obtained many patents in relation to such conductors.

4 Q. Have you been called on frequent occasions to advise and to testify as an expert in patent causes, and more particularly causes and questions wherein the subject of applied electricity, and more especially electric conductors, were involved?

A. I have been called to advise very extensively in relation to electric matters, including conductors, and I have frequently been called as an expert in causes in the United States courts.

5 Q. Are you familiar with and do you understand letters patent No. 272,660, granted Feb. 20, 1883, to Alfred A. Cowles, being the letters patent upon which this suit is brought, and do you understand the invention therein set forth?

A. I am familiar with the same. I prepared the application for this patent and procured the same for Mr. Cowles.

6 Q. What do you understand to be the invention or improvement in the art set forth in this patent?

Question objected to by counsel for defendant on the ground that the patent must speak for itself, and is the best evidence as to what the invention or improvement therein set forth was intended to be.

A. Upon considering the claim of the said patent the dis-
38 claimer and the state of the art as known by me at the time of procuring said patent, and in view of the patents referred to by the defendants in their answer, I understand the invention of complainant to relate to a certain method of manufacturing electric conductors and to the article produced by that method. Referring to the state of the art as before known by myself and to the facts communicated to me by Mr. Cowles, the inventor, during the preparation of his application, it was old to make use of a fibrous covering to the metallic wire, and it was old to saturate that covering with waterproof materials, such, for instance, as paraffine, pitch, tar, resin in a melted condition, and also gutta-percha and India rubber in a solution, and in some instances even paint has been made use of. These substances had been used to insulate the conductor electrically, so that the current passing along the wire might not escape by contact of the covering with the support or with any conducting substances.

So far as insulating the wire electrically, many of the coverings that had been made use of were practically successful, and many of them insulated the conductor even if immersed in water.

From communication with Mr. Cowles and others I became aware of the fact that in electric lighting the conductor in many instances become red hot, and a new source of difficulty and danger was thereby developed, not only from the heat of the wire itself, but from the covering catching fire and aiding in setting fire to any wood work with which the conductor might be in contact. Mr. Cowles informed me that he had endeavored to obviate this difficulty and had tested a large number of the known coverings and found that they did not answer the desired object; that he had applied paint to the outside of the fibrous covering, but that the same did not answer satisfactorily. In discussing the matter in the light of what had afterwards proved a success it appeared that the materials before made use of, such as pitch, tar, resins, and paraffine, when in a liquid condition soaked into the fibrous covering of the wire, whether that covering was in the form of a strip of muslin or of threads
39 wound around or braided upon the metallic conductor.

Hence it made but little difference whether the fibrous material was first applied to the wire and then soaked in these water-proofing materials while in a liquid condition or whether such water-proofing materials were applied to the strips or threads previous to winding them upon the wire.

In either instance the liquid material or materials penetrated the fibrous substances with uniformity or nearly so, because such materials were homogeneous.

When paint is made use of the conditions are very different. The paint is not homogeneous, but is composed of a metallic oxide or carbonate or similar earthy material and an oil or adhesive substance with which the earthy substance is ground.

The mixture, however, is always mechanical, and the oily substances can be easily separated from the solid substances by such an operation as filtration.

When paint is applied to the fibrous coating of an electrical conductor the oily materials are absorbed by the fibrous material and the solid substances remain almost entirely upon the surface, the fibrous materials acting similar to a filter. This is not the case with paraffine, tar, or similar material, and Mr. Cowles informed me that in the early manufacture of conductors, before he made the present improvement, he had painted the outside of the fibrous covering, but that complaints were made that this covering was not sufficiently fire-proof; that it was not sufficiently loaded with paint, and where he applied a heavier coating of paint it was liable to crack in the handling of the wire.

In view of these facts he had made the present improvement, and I understand the patent to relate to the same, namely, the confining and pressing into the fibrous covering of the solid material of the paint, so that such fibrous covering is filled and loaded with as much of the metallic oxides or carbonates as is necessary to render the fibrous covering practically fire-proof, and at the same time sufficient fibrous material is made use of to bind the non-combustible mineral substance of the paint, so that the same will not crack and break off under the ordinary handling to which the wire is necessarily subjected.

I understand the claim in complainant's patent, 272,660, to apply in substance to that which I have just explained, namely: "The method herein specified of insulating electric conductors and rendering the coating substantially non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets."

I do not understand that it is claimed that the electric conductor thus prepared is absolutely non-combustible, because if put into a furnace the materials would be partially consumed, but for all practical purposes of electric lighting the covering will not burn, even if the conductor becomes highly heated, and I understand that the second layer of fibrous material must be applied upon the paint before it dries or sets in such a way that the "paint that intervenes between the layers and fills the interstices of the covering" must not have hardened to such an extent as to prevent the threads of

the second covering imbedding themselves into the paint so that the interstices will be filled.

I understand the 2d claim of complainant's patent to relate to the article made by the process of the first claim, and that the article itself is distinguishable from other articles that had before been made, wherein paint might have been used, by the fact that the paint fills the interstices of the covering, which cannot be the case where paint is applied on the outside only or where a second layer of fibrous material is applied outside of a paint that may have become hardened to such an extent that the threads do not imbed themselves into the same.

7 Q. Have you read the testimony of John E. Earle, the defendant's expert witness in this cause, and have you examined and do you understand the several patents referred to in Mr. Earle's testimony? If so, state whether or not you find in any or all of
41 said patents the invention described and claimed in the Cowles patent, giving the reasons for such conclusions at which you have arrived.

A. I have examined the testimony given by Mr. Earle and also the patents referred to by him. It is true, as Mr. Earle says, that in some of these patents a layer of fibrous material has been applied to the wire and the second layer has been applied upon a material, such as tar, pitch, resin, while in a melted or unset condition, but, notwithstanding the great number of patents referred to in the answer of defendants and which are cited in the evidence of Mr. Earle, I do not find any instance where the method pursued by complainant in applying the covering to the conductor is made use of, because there is not a single instance in which the second layer of covering binds into itself and presses into the first layer non-combustible substances, such as metallic oxides or carbonates. For the reasons before given by me it will be understood that the metallic oxides or carbonates are solid materials and can never be rendered liquid by heat or by the oil with which they are mixed. The oil simply acts as a vehicle to hold the solid particles together until those solid particles can be bound into the fibrous coating and so pressed as to fill the interstices thereof. I do not find any such method described in any of the numerous patents which have been referred to by the defendants.

And, although it is true that one layer of covering has been wound upon another, and that the asphaltum or similar material was in some instances forced into the fabric, the asphaltum or a similar material is not in any respect the equivalent of the non-combustible solid substances in the form of oxides or carbonates, and there is very little developed in the testimony of Mr. Earle but which has been acknowledged to be old in the disclaimers in the patent of complainant.

Where asphaltum, tar, resin, or materials of this nature are made
use of they bind the fibers themselves together. There is no
42 adhesive property in metallic oxides or carbonates; hence,
when the method of complainant's patent is made use of, the fibers bind the metallic oxides to their places instead of the reverse,

when the filling material is asphalt, pitch, or the like; hence, in my judgment, the method pursued in the two cases are radically different, and the method employed by Mr. Cowles is not the method described in either of the patents named in defendant's answer.

It is true that metallic oxides alone cannot be made use of. They must be mixed with some adhesive substance, such as linseed oil, in order to remain upon the covering while the second layer is imbedded into the paint, and thereby confines the metallic oxides, but there is no utility in the linseed oil except as an adhesive material, and the smaller the quantity of oil the better, so long as the necessary adhesive property is obtained. Of course, in addition to the non-combustible property of the covering, which is due solely to the metallic oxides or carbonates, it is important to exclude moisture. The linseed oil or similar material present in the paint renders the covering practically water-proof under the ordinary circumstances of use, as well as acting as an adhesive substance to hold the particles of the metallic oxides or carbonates in place between and within the binding fibrous threads.

8 Q. Please compare the English patent of Brown and Williams, No. 12991 of 1850, and the other patents referred to specifically in Mr. Earle's testimony and the inventions therein described with the invention set forth in the Cowles patent.

A. In English patent No. 12991 of 1850 two or more layers of fibrous covering are made use of, but gutta-percha or mineral or vegetable pitch are spoken of as the insulating material. Nothing is said about paint, and the gutta-percha, pitch, or similar material is applied in a heated condition, and soaks into and unites the several coatings.

I do not find the method or the article of complainant's patent for the reasons before mentioned, and the insulation is not in any respect fire-proof.

43 In the English patent 906, of 1853, the insulating material is placed in a funnel and the wire is drawn through the same, and a second funnel and fibrous material are made use of, but I fail to find any method of rendering the covering fire-proof by any such material as metallic oxides or carbonates.

In the English patent 933 of 1857 it is true that the insulating material in a semi fluid condition is within a trough, and that spools or reels for the wire are made use of and ribbons are wound successively around the wire, but the insulating materials spoken of are bituminous, and I find no provision for fire-proof oxides or carbonates being bound into the fibrous covering according to the method in complainant's patent.

I discover on page 32 of Mr. Earle's testimony that he admits that the difference between this English patent No. 933 of 1857 and complainant's patent is that Mr. Cowles makes use of paint instead of insulating materials. As I have before shown, paint composed of an oxide or carbonate is radically different in the mode of application and the objects attained from such insulating materials as are named in this patent, which are highly inflammable, such as "India rubber, resin, gum lac, fatty oils," &c., and in which the materials,

when softened by heat or a solvent, penetrate the fibrous covering with uniformity.

The next patent referred to by Mr. Earle in No. 434 of 1859, in which mention is made of pitchy and resinous compounds, tar, asphaltum, gum lac, pitch, all of which are very inflammable and all of which when melted or in solution penetrate the fibrous material uniformly, and, although two or more layers of fibrous material are spoken of in this patent, the method employed is not the method of complainant's patent, because there are no solid non-combustible particles to be bound into the covering by the threads thereof.

In English patent No. 464 of 1863 India rubber or gutta-percha are made use of as the water-proofing substance with which the fibrous layers are saturated, and this patent, obtained by Charles William Siemens, a celebrated electrician, is based on the use
44 of the juice or milk extracted from the India rubber or gutta-percha tree in its native state in place of the same materials (gutta-percha or India rubber) artificially dissolved.

This patent does not contain any reference to solid fire-proof materials, such as metallic oxides or carbonates, and, in my judgment, does not contain for that reason the method set forth in the Cowles patents of confining such oxides or carbonates between the fibres.

In the English patent No. 1126 of 1864 it is true that two or more layers of yarn are wound upon the wire and an interposed insulating material, but such insulating material was not paint having metallic oxides or carbonates confined by the winding to render the same fire-proof.

I may remark that these English patents all relate to insulating the wire electrically and not to the rendering of the covering fire-proof.

In English patent No. 2942 of October 19, 1867, an apparatus is shown corresponding to that in the United States patent No. 79126, dated June 23, 1868, and in this apparatus provision is made for applying hot bitumen as a bath to the paper or other material wound upon the wire.

Nothing is said in relation to a method of confining non-combustible substances, such as oxides or carbonates.

The foregoing remarks apply to English patent No. 3314 of 1870, in which mention is made of the steam-jacket to heat the insulating material, such as India rubber, gutta-percha, or their compounds. No provision is made for confining a fire-proof material between fibres, but, on the contrary, after the insulated conductor has been otherwise completed it is drawn out through a die, which removes surplus material, and chalk, silicate, or other earthy dust is applied to the surface to remove any stickiness.

This does not anticipate the Cowles invention.

45 In English patent No. 1333 of 1880 insulating material is applied in a hopper, and a thread is wound upon the wire or braided thereon.

Nothing is said about a method of encasing and confining metallic oxides and carbonates to render the covering fire-proof, and for that reason I do not discover the subject-matter of complainant's patent.

Adjourned to Tuesday, November 30th, 1886, at 10.30 o'clock
G. T. P., *Ex'r.*

NEW YORK, *November 30th*, 1886.

Met pursuant to adjournment.
Counsel present as before.

Continuation of examination of Mr. L. W. SERRELL:

8 A. (continued). In English patent No. 1333 of 1880 a hopper is represented into which may be received a coating material, and winding and braiding devices are also represented; but I do not find in the said patent any statement in relation to a fire-proof covering in which the solid carbonates or oxides of metal are imbedded into the two coverings in the act of winding; hence I do not find the subject of either the first or second claims in complainant's patent. It is also true that in several of these English patents mention is made of the fact that the composition may be any insulating medium, but I do not find in any of the said patents any statement giving the information necessary to enable a person skilled in the art to render the covering of a conductor substantially fire-proof by binding into that covering the metallic oxides or carbonates to insulate the wire electrically by a fire-proof covering.

In some instances the electric conductor has been covered by gutta-percha or by similar water-proof non-conducting material, and this has been protected by an armor, such as that made
46 use of in submarine cables, and in some instances the covering to this gutta-percha has been painted or saturated with paint; but this is expressly described as applied to the gutta-percha-covered conductor in place of pitch or bituminous material in order to avoid the injury to the gutta-percha resulting from the heated condition of the pitch or similar material that had before been used in protecting the gutta-percha-covered conductor.

In this relation I refer to the English patent No. 175 of 1861; and this patent further describes that "the iron or steel wires that are used to give strength to the electric telegraph cable" may be covered with fibrous material saturated or coated with paint. It is to be observed that this portion of the description does not relate to the conductor itself, but to an armor that is applied outside the gutta-percha-covered conductor to adapt the same to use as a submarine cable, and from this description no person would be able to make the wire covered by complainant's patent, and the conductor itself would not be rendered substantially fire-proof, as required by complainant's patent, because the gutta-percha forming the covering of the conductor itself is highly inflammable and would be burned up if the conductor became highly heated by the electric action.

The same remarks apply to the English patent 2056 of 1860 and to 2008 of 1869. In the latter instance, however, the carbonate of lead is spoken of in connection with litharge and sawdust mixed with a proper consistency and used in place of gutta-percha.

Where a covering of cotton threads is spoken of the same is applied upon the gutta-percha, and from this patent no person would, in

my judgment, obtain information that would enable them to construct the fire-proof conductor according to complainant's patent.

In English patent 2547 of 1872 the conductor is first covered with gutta-percha, and then a coating of boiled linseed oil or other drying oil, mixed with red lead, is applied upon the gutta-percha, as I understand it, without any fibrous winding.

47 This has no bearing, in my judgment, upon the invention of complainant.

In the English patent 3083 of 1873 provision is made for applying upon fabric-covered wire a solution of white lead, boiled or raw linseed oil, tallow, and naphtha, which, of course, is not a fire-proof composition, and it is only applied to the outside of one covering, and the same patent also provides for forming a cable of a series of wires coated with strips soaked in white lead, pitch, and oil, and a final exterior coating to the cable is spoken of for rendering the same both fire and water proof; but this coating is simply a paint upon the outside, which, of course, does not take away the combustible character of the inner coverings, containing pitch, tallow, and similar material; and it will be borne in mind that electric telegraph cables submerged never become heated in consequence of the electric action, and the cable made according to this patent is not adapted to electric lighting purposes because it would be destroyed by the wire itself becoming heated.

Varnish or paint have been applied outside of water-proof insulating materials, which water-proof materials are almost always of a combustible nature.

In summing up the state of the art as developed by these numerous patents referred to in defendant's answer it may be frankly admitted that paint has been used in connection with electric conductors as a protection for an interior water-proofing coating of combustible material, in which case the paint formed or became part of an armor for the electric insulating material. I do not find any instance where the electric conductor itself was insulated and the coating of fibrous material rendered substantially non-combustible by paint laid in between the two layers of fibrous material so that the particles of oxides or carbonates are pressed and bound into the fibres so as to fill the interstices thereof as set forth in complainant's patent and secured by the claims thereof.

9 Q. Have you read, and do you understand, the testimony of defendant's witness, Elwin Holmes, in this cause?

48 A. I have, and I do.

10 Q. Calling your special attention to the answer of Mr. Holmes to the third interrogatory on page 111 of the printed testimony, and also the answer to the 9th and 10th interrogatories on pages 112-113, please state whether or not you find the covered wires therein described embodying the invention as described and claimed in the Cowles patent, and state the reasons for such conclusions as you may have arrived at as to that matter.

A. It appears from answer to the 3d int. that the covering was painted in the first case by a brush, and afterwards by drawing the

wire through a vessel containing the paint; and that the surplus paint was removed.

This is not the invention of Mr. Cowles, and his patent does not apply to a single covering painted upon the outside.

Upon reference to interrogatories 9, 10, and 11 I understand that the second covering of thread was painted simply on the outside in the same manner as the first covering. In the answer to the second, 10th interrogatory, Mr. Holmes states that the first coat was partly dried so as to keep its place, but would admit of an impression from the next covering of thread.

This answer appears to be very indistinct, because the paint upon the first layer of fibrous material would keep its place whether wet or dry, and no matter how dry the paint might be it would admit of an impression from the next covering of thread, because these threads are under considerable tension, and a coating of paint upon a layer of fiber would be impressed by a second layer of thread. This is not what complainant's patent calls for, which is that the second layer of braid shall force the paint into the first braided covering, and at the same time the paint oozes through the thread of the second covering; hence the paint is incorporated throughout the braided covering and fills the pores. This could not be the case if the first coat simply received an impression from the covering thread.

Hence this coated conductor spoken of by Mr. Holmes was
49 not, in my judgment, made in accordance with complainant's patent.

11 Q. Do you find anything in Mr. Holmes' testimony indicating or intimating the length of time that may have elapsed between the application of the first coat of paint and the second coat, whether it was a month or more or less?

A. I do not.

12 Q. Look at the testimony of defendant's witness, Charles Williams, more particularly the answer to interrogatory 5, and say whether or not you discover therein anything embodying the invention described and claimed in the Cowles patent?

A. I have examined the testimony of Charles Williams, and the insulated wire described by him was not made in accordance with the Cowles patent, because the first covering of cotton was passed through glue, which is of a well-known penetrating character, and filled the pores of the cotton and the surplus glue was wiped off, and the paint applied to the surface of the said covering cannot have penetrated such covering, because the glue would entirely prevent the absorption even of the oil in the paint. An electric conductor covered, according to the testimony of Mr. Williams, would not, in my judgment, come within the terms of complainant's patent, and it would not in any respect be fire-proof, because the glue would burn up and render the covering more combustible instead of making it fire-proof.

It appears also that the painting was done by a brush and by hand after the wire had been wound upon a reel.

13 Q. Would, in your opinion, an electric lighting conducting-wire covered and treated in the manner in which Williams states

that his wire was made be suitable or practically available for that purpose under the various conditions to which an electric light conductor is subject?

A. In my opinion it would not, because the glue and the fiber both would be ignited if the wire became heated by the action of the electric current, and the paint, being on the outside, would be useless in rendering the covering fire-proof.

50 NEW YORK, *December* 14, 1886.

Examination of LEMUEL W. SERRELL resumed:

14 Q. Assuming that you have given a careful and critical examination of all the several patents put in evidence by the defendant, and particularly those especially referred to in the testimony of Mr. Earle, I ask you to state whether or not you have found, in any one or more of said patents, the description of a process for insulating wires, consisting of the following steps: 1st, applying a layer of fibrous material on the wire by braiding or winding thread thereon; 2d, applying a layer of paint or its equivalent on the core thus wound or braided; 3d, applying a layer of fibrous material by braiding or winding thread upon the paint or its equivalent whilst the latter is in a wet, green, or unset condition. Please give the reasons for such conclusions as you may state in answer to this question.

A. I have not found in any of said patents a description of the process corresponding with the successive steps named in the question. In cases where a strip of woven material, such as a tape, is laid upon the wire longitudinally or spirally, it is not the equivalent of threads wound or braided thereon, because the paint or equivalent material laid thereon to form the second stage of the process does not penetrate the strip of woven material in the sense spoken of in the patent of complainant, as the paint becomes simply imbedded into the surface instead of the paint being bound by the threads, and these remarks apply to the third stage of the process.

15 Q. Please answer the same question, substituting in the second step for the words "paint or its equivalent" any insulating material whatever, such as asphaltum, for instance.

A. Referring to the patents named in Mr. Earle's testimony, I do not find any instance where a braiding or winding of thread has been applied on the wire, then a layer of insulating material, and
51 third, a braiding or winding of thread directly upon the insulating material while the latter is in a wet, green, or unset condition.

16 Q. Do you consider asphaltum in this connection to be an equivalent of paint? And in replying to this question please give your idea of what constitutes an equivalent of paint.

Question objected to by counsel for defendant as requiring of the witness to state as a matter of fact what is in reality a question of law.

A. Asphaltum and bituminous materials are all inflammable, and

if introduced in place of paint in the covering of an electric conductor would render that covering inflammable instead of fire-proof. In the mode of operation or process involved in covering the electric conductors the action of asphalt or bituminous material in the heated or dissolved condition in which it has to be used is very different from that of paint.

The bituminous material, being substantially homogeneous, penetrates the fibrous covering almost instantly and with uniformity, especially as the high heat of the melted bitumen expels the air from the fibrous materials and the bitumen fills such pores or interstices.

With paint the operations are radically different; the solid or earthy materials, such as metallic oxides or carbonates, do not by any affinity flow into the pores or interstices, but require to be forced into the same by the mechanical power exerted in winding or braiding the thread, the oil alone, which is one of the constituents of the paint, passing into the fibrous material by capillary action, and when paint is made use of there is nothing to expel the air from the pores of the thread except the mechanical pressue of the thread upon the paint.

The foregoing answer, all except the first five lines, is objected to by counsel for defendant as not responsive to the question and being a repetition and amplification of an answer previously made by the witness.

52 17 Q. Mr. Earle has stated, in reply to int. 12, defendant's testimony, that in view of the prior art as disclosed in the patents referred to in his testimony that, in his opinion, the Cowles patent does not disclose anything new or any patentable subject of invention. State whether or not you agree with this opinion; and, if nay, give your reasons for your opinion.

A. I do not agree with Mr. Earle, because the statement of his first and third points of the process do not correspond with the 1st and third steps of the process in the Cowles patent.

He does not distinguish between a layer of fibrous material, such as a strip of woven cloth and a winding or braiding of threads such as in the Cowles patent.

Where a layer of fibrous material is made use of, such as a woven strip, it is impossible to incorporate the paint throughout the covering in such a way as to fill the pores, and I do understand that the Cowles patent is limited as to the method of applying fibrous material. I do not understand that the said patent applies to a tape or woven strip, which, of course, when put upon the wire would make a fibrous layer.

Adjourned to Wednesday, December 15th, 1886, at 10 o'clock a. m.

G. T. P., *Notary.*

NEW YORK, *Dec.* 15, 1886.

Met pursuant to adjournment.
Counsel present as before.

Examination of Mr. LEMUEL W. SERRELL resumed:

18 Q. State whether or not, in view of the prior state of the art, as it appears from the testimony and exhibits in this case, the change made by the Cowles invention involves any patentable subject of invention.

A. Upon reference to the patents introduced by the de-
53 fense and to the samples illustrating the mode of manufacture described in said patents it will be found that the various articles patented approximated very closely to each other in many instances, and that these different insulated wires were invented and patented from time to time to obviate difficulties and to accomplish objects developed from time to time.

Among all of these prior patents and exhibits there is not one that is adapted to electric lighting purposes as the same exists to-day. From conference with Mr. Cowles prior to applying for his patent, and from conference with numerous electricians, I became aware of the defects existing in the wire that was used for electric lighting purposes prior to the invention of Mr. Cowles, and I also became aware of the numerous efforts made by Mr. Cowles to overcome these difficulties.

If the changes made by Mr. Cowles had been obvious and such as would suggest themselves to any electrician the difficulties would have been overcome, but instead of that the difficulty was known and recognized, but the want was not supplied until Mr. Cowles, by a series of experiments, succeeded in producing the invention that forms the subject-matter of complainant's patent.

My opinion, therefore, based upon these facts, is that the changes made by Mr. Cowles were not such as would be obvious to a person skilled in the art, and that it was only after extended experiment and persistent efforts Mr. Cowles succeeded in producing the improvements in question.

The last answer is objected to by counsel for defendant on the ground that the same contains statements of fact that must necessarily have come to the knowledge of the witness by hearsay, and were not within his own knowledge, because the same is argumentative in its character and not responsive to the question asked, but a voluntary statement on the part of the witness; and de-
54 fendant's counsel gives notice that at the proper time and place he will move to have the same stricken from the record.

19 Q. In reply to interrogatory 14 you stated that you did not find in any of the prior patents a process embodying the three steps suggested in the interrogatory. Now, please state whether or not you find that the said three steps were practiced by either Holmes, Williams, or Reed in doing what they have testified to as having been done by them.

A. I do not. In one or more particulars in each instance what I understand that they did was different from the steps named in the 14th question.

I do not find in their testimony any instance where the 2d layer of fibrous threads was wound or braided upon the paint while in a wet or green condition so that the threads of such second winding confined the solid materials of the paint and forced them into the interstices of both the first and second layers of thread.

LEMUEL W. SERRELL.

Affirmed and subscribed before me this 15th day of Dec., 1886.

GEORGE T. PINCKNEY,
Notary Public, Kings Co.

Cert. filed in N. Y. Co.

Counsel for complainant hereby notifies defendant's counsel that they propose to cross-examine the defendant's witness, Thomas L. Reed, under the agreement of September 23d, 1886, noted on the record, and they suspend the examination of the witness Mr. Serrell until after the cross-examination of Mr. Reed.

Counsel for defendant, in reply to the notice above set forth, states that on Sept. 23, 1886, when the offer and stipulation referred to by the complainant's counsel was made, Mr. Reed, the witness therein referred to, was too ill to attend the examination, but that
55 the defendant's counsel had the written assurance of Mr. Reed that he would testify as soon as his physician would let him, and that the stipulation of Sept. 23, made by the defendant's counsel, was entered into upon that understanding. He further states that Mr. Reed is not in the employ of his clients and never has been, and that they have no ability to compel his attendance, but that if Mr. Reed can be induced to attend at the next examination counsel for defendant will produce him for cross-examination on the part of complainant.

Counsel for complainant express the hope that defendant's counsel may be able to produce the witness and say that they made the admission of record upon faith of the stipulation of defendant's counsel that the witness should be produced, as also appears of record; and counsel for complainant give notice that they will attend at Mr. Earle's office at any time within the stipulated period, and will, upon seasonable notice, agree upon another place if defendant's counsel desires, and complainant's counsel withdraw their said admission unless said witness is produced for cross-examination, and — default of opportunity for cross-examination will move to strike the exhibits referred to in said stipulation from the record.

56 NEW YORK, N. Y., *Jan. 11th*, 1887.

Met pursuant to adjournment.

Present: Joshua Pusey, Esq., of counsel for complainant; Morris W. Seymour, Esq., counsel for defendant.

Examination of Mr. L. W. SERRELL resumed.

Cross-examination by Mr. M. W. SEYMOUR, Esq., counsel for defendant:

20 X Q. In answer to your 6th direct interrogatory you speak of certain facts communicated to you by Mr. Cowles, the inventor, while you were preparing the specifications and claims of his patent. Were those facts communicated to you orally or in writing?

A. Both.

21 X Q. Were the facts communicated in writing in the form of letters and correspondence?

A. Yes; in some instances.

22 X Q. Have you that correspondence?

A. I have some of it.

23 X Q. Do you know whether it is all in existence or not?

A. The correspondence which passed with me personally is in existence as far as I know. I saw some letters of Mr. Cowles that did not come into my possession. I do not know where those are.

24 X Q. In the same answer you make use of this language: "I understand the invention of the complainant to relate to a certain method of manufacturing electric conductors and to the article produced by that method." The method of manufacture is set forth in the first claim of the complainant's patent and the article produced by that method is set forth in the second claim of said patent, is it not?

A. That is correct.

25 X Q. Do you consider that the article produced—the
57 product claimed in the second claim of the complainant's patent—is limited to an article manufactured under the process claimed in the first claim?

A. I do.

26 X Q. In your testimony you several times make use of the expression "to insulate the conductor electrically."

Please explain what you mean by that expression.

A. There is not any one substance that I know of that is absolutely proof against the passage of a current of electricity, provided the current is strong enough. An electric insulation or that which will insulate the wire electrically is recognized as a covering sufficient to prevent the passage of an electric current under ordinary circumstances.

27 X Q. In the same answer you state that Mr. Cowles informed you that he had applied paint to the outside of the fibrous covering.

Did he describe to you any of the methods that he had used to make this application?

A. My recollection is that the discussion was very full from time to time, and I understood that he had applied the paint with a brush upon the fibrous covering and also by dipping the covered wire into paint.

28 X Q. In your opinion, does a proper interpretation of the

Cowles patent require that a second layer of fibrous material should be applied to or placed upon the paint before it dries or sets?

A. It does. The paint upon the first layer, according to my understanding of the Cowles patent, must be sufficiently soft for the second layer to imbed itself into the paint, pressing the paint into the first layer and causing the paint to ooze into or through the second layer.

29 X Q. Do you understand that practically in producing the Cowles product it is essential that the second layer of fibrous material should be placed upon paint before it dries or sets?

A. I so understand it, in order to produce an article that possesses the properties of the Cowles covered conductor, and is adapted to the circumstances of use.

58 30 X Q. If a manufacturer should cover a No. 6 copper wire with a fibrous jacket and then saturate it with paint, either by running it through a vessel containing paint or by painting it by hand, and then thoroughly drying it and then repeating the same operation upon it, would or would not such insulated wire be produced by a method that would infringe the process claim of the Cowles patent?

A. It would not, in my judgment, because the second layer would not be incorporated with the paint upon the surface of the first layer, the question presupposing that the paint upon the first layer is dry.

In this condition the two layers are liable to separate when the wire is bent, and the covering would be inferior to that made by the Cowles process and it would be more expensive to manufacture.

31 X Q. Would an electric conductor produced after the method described in my last question infringe the product claimed by the second claim of the Cowles patent?

A. In my opinion it would not.

32 X Q. Am I correct in understanding from the Cowles patent that it is immaterial whether the fibrous covering or jacket be applied to the wire by braiding or winding?

A. The specification sets forth that the threads may be wound in place of being braided. I do not consider the patent limited to the threads being braided; but, practically, the braiding is preferable.

33 X Q. Is there anything in the patent, as you read it, which describes any particular kind of paint that should be used?

A. Lines 34, 35, 36 state that "this vessel *c* contains paint, preferably white lead or white zinc ground in oil and mixed with a suitable drier."

34 X Q. Do you understand that this limits the patent to any particular kind of paint?

A. Not that statement alone, but the whole patent is limited to such a paint as is substantially non-combustible, and the paint named, when employed in the manner described, is substantially non-combustible.

59 I do not understand the patent as applying to a paint that is easily combustible.

35 X Q. Please now answer cross-question number 33 and state

whether you find anything in the complainant's patent which describes that any particular kind of paint should be used.

A. I do not find an express statement that limits the particular kind of paint that is to be used, but the patent states in addition to what I have before mentioned that the inventor had "discovered that ordinary paint composed of lead or zinc with linseed oil is practically non-combustible." I understand that this is to be regarded as a limitation and that paint that is combustible is not included in this patent, and this is to be distinguished from asphalt and bituminous materials which are combustible and which are sometimes used as a paint, but not in the ordinary sense in which that word is made use of.

36 X Q. What substance or material is it in the white-lead paint which makes it practic*able* non-combustible?

A. The white lead being a carbonate is not subject to decomposition easily in the presence of heat and the atmosphere and practically it is not liable to change or combustion by the heat developed in an electric conductor by short circuiting or a resistance. The linseed oil in paint is to a certain extent combustible. The carbonate of lead is the material that is both non-combustible and a non-conductor.

37 X Q. What substance or material is it in the white zinc paint which makes it practically non-combustible?

A. In the manufacture of zinc white the metallic zinc is actually burned in the presence of heat, and the atmosphere, and the oxygen combining with the zinc forms the zinc white, and the zinc having been burned up once cannot be burned up the second time; hence the zinc white is non-combustible.

38 X Q. The zinc white having been produced in the manner which you have described is made into a paint by what process or method?

60 A. Mixing with an oil, such as linseed, and usually grinding to render the mixture intimate and uniform.

39 X Q. How many years, in your opinion, has zinc-white paint been produced in the manner which you have just described?

A. My recollection is that I was concerned with an interference before the Patent Office on that subject about twenty-two years ago.

40 X Q. How long, in your opinion, has white-lead paint prepared in the manner in which you have described, been in common use?

A. As long as I can remember, and I can't give the date of its discovery from memory. Upon reference to encyclopedia I find it was introduced about 1780.

41 X Q. Referring you to your direct testimony, questions numbers 14 and 15 and your answers to the same, I would ask you whether you have not found in any of the patents introduced by the defendant in this case the description of the process for insulating wire which consists of applying a layer of fibrous material onto the wire either by braiding or winding thread thereon?

A. Before the invention of Mr. Cowles a layer of fibrous material had been wound upon the wire.

42 X Q. And this for partially insulating the same, had it not?

A. Yes.

43 X Q. Do you not also find the description of a process by which some insulating material has been applied upon this fibrous covering?

A. Yes.

44 X Q. Do you not also find the description of a process by which a second covering of fibrous material has been wound upon this wire whilst the insulating material was in a wet and unset condition?

A. Yes; the insulating material being of a combustible nature, such as pitch or asphalt.

45 X Q. Had the successive steps been the same as in the last three questions and at the times and manner in them described and the insulating material been a paint of white lead or zinc white, would you have found the exact process of the Cowles patent or not?

61

A. In Ques. 44 the fibrous material spoken of might be a tape or strip and not a thread. I do not understand the Cowles patent to apply to a covering such as a strip or tape wound or laid upon the wire, whether paint is used or not, for the reasons given in my direct testimony. If the successive steps named in the last three questions had included as one of the steps a winding of tape it would not have been the process of the Cowles patent.

46 X Q. Assuming that "the successive steps named in the last three questions" do not include and are not intended to include as one of them a "winding of tape," but the braiding or winding of a thread, will you please answer X question number 45?

A. There are instances before the Cowles invention where more than one winding of thread had been applied to a wire and where asphalt or other combustible and bituminous material had been applied to the successive windings in a heated condition. Hence, if paint had been substituted for the asphalt the operations performed would have corresponded generally to the process of the Cowles patent, but the object sought to be obtained in these former cases was radically different, and there is no intimation in such patents of the Cowles process.

Adjourned to Wednesday, January 12th, 1887, at eleven o'clock.

G. T. P., *Notary.*

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NEW YORK, N. Y., *Jan.* 12, 1887.

Met pursuant to adjournment.

Counsel present as before.

Mr. C. E. Mitchell, of counsel for complainant, also present.

Cross-examination of Mr. L. W SERRELL by Mr. SEYMOUR continued:

47 X Q. Calling your attention to English letters patent No. 1126 of 1864, one of the exhibits in this case, please state whether in that patent you do or do not find illustrated and described an apparatus which consists of at least two machines to apply successive layers of

cotton thread or other suitable fibrous material upon a wire which is run through the said two machines substantially as it would be covered by the two braiding machines described in the complainant's patent in suit, with the exception that winding the threads takes the place of the braiding.

A. I have examined the patent referred to, and I discover that the material spoken of is "linseed oil and resin in about equal proportions: resin, gutta-percha, and bees-wax also answer the purpose very well."

These are placed in a vat and heated by steam. The wire covered with a winding of cotton is passed through this composition, and then it passes through a conical die that presses the hot compound into the cotton and takes off all the superflous material, and then there is a second winding of cotton applied thereon. I do not find illustrated and described two machines to apply the successive layers of cotton thread upon the wire substantially, as it would be covered by the two braiding machines described in complainant's patent, because in this English patent the liquid insulating material in a hot condition is forced into the first covering by the action of the conical die, and the surplus material is also removed
63 by that die, whereas in complainant's patent the second layer of thread, whether braided or wound, forces the insulating material into the first covering, and the surplus insulating material, instead of being scraped off by a die, fills up the interstices of the second coating of thread and oozes through between such thread; and, in the particulars named, the process made use of by complainant also differs from the process of the Henley patent.

Last answer objected to by counsel for defendant as not being in response to the question asked, and counsel for defendant gives notice that at the proper time and place he will move to strike the same from the record.

48 X Q. Please now answer question number 47.

A. If counsel for defendant will point out any portion of cross-question 47 that is not answered it will give me pleasure to answer it if I am able to so. As I understand the question I should simply have to repeat the answer.

49 X Q. Please state whether or not in the English patent No. 1126 of 1864 you find illustrated and described an apparatus which has at least two machines to apply successive layers of cotton thread or other fibrous material upon a wire.

A. I do.

50 X Q. Please state whether in that same patent you find or do not find that when the wire has passed through the said two machines and received a jacket of cotton thread or other fibrous material it would be covered as it would be after passing through the two braiding machines described in the complainant's patent in suit, with the exception that winding takes the place of braiding.

A. Leaving out of the question the liquid or semi-liquid insulating material, I answer yes.

51 X Q. Do you or do you not find in this same patent illustrated

and described a bath containing some machines, of which
64 we have been speaking, so that after the wire has received one covering of fibrous material it will be led through the bath and receive a coating of such insulating material as the bath may contain to the second covering machine?

A. In the limited form stated in the question I answer I do.

52 X Q. So that it would be true, would it not that the second covering machine would lay its fibrous covering directly upon the insulating material, whatever it was?

A. I think not, because if the insulating material is forced into the first covering and the surplus removed the second covering would be laid mostly upon the surface of the first covering.

53 X Q. You say "mostly;" would it not in some degree?

A. Of course the second covering would touch the insulating material that might remain upon the surface of the first covering, and it would also touch such insulating material that remained between the threads of the first covering, but the thread of the second covering would not be imbedded into the insulating material; neither would that insulating material fill the interstices of the second covering.

54 X Q. Does not that patent show that the fibrous covering, the insulating material, whatever it may be, and the second coat of fibrous covering are applied to the wire as a part of one continuous operation?

A. I think not. The wire may be led an indefinite distance between one operation and the next, and it is shown as passing over one guide wheel after leaving the bath before reaching the second revolving head that applies the second coating of fibrous material.

55 X Q. Would "the distance" between one operation and the next, if the same wire was led through continuously the various steps, prevent the operation of insulation being a continuous one?

A. It would be no more continuous than it would if the wire was wound upon a reel between applying the first and second coating.

65 It is true that the two operations are going on at the same time, but I do not understand that the second coat of fibrous covering is applied to the insulating material as part of one continuous operation, because the first operation is finished when the insulating material is applied to the first covering and forced into that covering and the surplus scraped off.

The distance between one operation and the next would prevent the operation being continuous, because the insulating material of the first operation would set and harden before reaching the second covering if the distance was sufficient, the wire necessarily receiving a slow movement.

56 X Q. If "the distance was (not) sufficient" to permit the insulating material of the first operation to set or harden before reaching the second covering, would that fact make any difference with the insulation of the wire being a continuous operation?

A. As I understand the expression "continuous operation" I presume it to apply to one operation that is not complete or finished

and not to apply to two independent operations. If, as is the case in this English patent, the first operation is complete in itself when the surplus insulating material is scraped off, then the second operation is an independent operation and not a continuation of or continuous with the first.

57 X Q. Please, now, answer my question number 56, which is a quotation from your own previous answer, whether the distance between the application of the various steps described in this patent makes any difference as to whether the operation is a continuous one or not.

A. It certainly does make a difference. This Henley English patent speaks about the covering disk being placed on an upper floor some distance above the vat and steam-chest, so that the second operation, instead of being a continuation of the first, is really an independent operation. Both operations, however, are going on at the same time.

65½ 58 X Q. If the disk, instead of being placed upon the second floor, was placed the sixteenth part of an inch from the vat would the operation, in your opinion, be a continuous one?

A. You could not make it work at all; you could not place the disk the sixteenth part of an inch above the vat. If the covering disk was placed as close to the vat as possible it would make a difference in the operation, because the second operation might then become a part of the first operation, but no provision for that is made in the Henley patent.

59 X Q. If it should be placed as you have described in your last answer, would the operation be a continuous one or not?

A. I think it would.

60 X Q. So it would be true, would it not, that if the vat was placed in that juxtaposition which made the operation a continuous one the second covering machine would lay its fibrous covering directly upon the insulating material, whatever it was?

A. Of course it would be; but that would not be what Henley proposed to do.

61 X Q. Please read lines 23, 24, 25, and 26, page 2 of the provisional specification of the Henley patent.

A. "I am aware that attempts have been made before to insulate telegraph wires by alternately covering with cotton or silk and resinous matters, but owing to each covering having been made a separate operation the work was so imperfectly done that the covering was useless as an insulator."

62 X Q. Are not these same words repeated in lines 15, 16, 17, and 18, page 6 of the complete specification?

A. They are.

63 X Q. Please read the 2d claim of the patent.

A. "Second. The insulating of the conducting wires with one or several coatings of compositions and fibrous materials at one and the same time, as hereinbefore described and illustrated at figures 1, 2, and 3, sheet 1 of the accompanying drawing."

64 X Q. What do you understand the insulating material

placed in the bath between the two covering machines in this Henley patent to be?

66 A. In this Henley patent he says, "Neither do I confine myself to any particular composition for saturating the cotton, but find a very cheap and serviceable material in a mixture of linseed oil and resin in about equal proportions. Resin, gutta-percha, and beeswax also answer the purpose very well."

I read from page 6, lines 26 to 29, of the Henley patent.

65 X Q. Do you not find the same statement on page 2, lines 34, 35, 36, and 37?

A. I do.

66 X Q. If I understand your direct testimony correctly, you say that prior to the invention of the Cowles patent in suit that paint prepared of the metallic carbonates or oxides, mixed with some fluent substance, had been used in connection with fibrous covering on wire for the purpose of insulating it electrically. Am I correct in so understanding?

A. Paint had been used upon the outside of one layor of fibrous material as a protection to the fibrous material.

67 X Q. Was that for the protection of the fibrous material only?

A. Primarily for the protection of the fibrous material, but the paint, being also a non-conductor, aided in the insulation.

68 X Q. Can you quote from a single patent of all the patents referred to in this case in which it is stated that the paint is used primarily "to protect the fibrous material," or from any other patents that you have examined in connection with this case?

A. In English patent No. 2321 of 1858 the following statement occurs:

"For the purpose of preserving one or more wires or conductors when laid or placed in the interior of a rope or cable I use a covering composed of hemp or other fibrous material saturated with a composition consisting of some one or more of the metallic carbonates or oxides mixed with some of the fixed oils."

67 69 X Q. Do you cite that quotation in support of your answer to X question 66?

A. Generally. I was also aware that paint had been used upon the outside of one layer of fibrous material by Mr. Cowles before making the present invention.

Adjourned to Thursday, January 13, 1887, at 10 o'clock a. m.

G. T. P., *Notary.*

NEW YORK, *January 13th*, 1887.

Met pursuant to adjournment.

Same parties present.

Continuation of cross-examination of Mr. L. W. SERRELL by M. W. SEYMOUR, Esq., counsel for defendant:

70 X Q. In your answer to cross-question 56 you say, "When the surplus insulating material is scraped off," &c. What do you mean by that expression, "surplus insulating material"?

A. The patentee makes use of the word "superfluous." By either word I understand is meant so much of the hot compound as is not pressed into the cotton.

71 X Q. Referring you to cross-question 52 and your answer thereto, do I understand you to say that the second covering machine described in the Henley English patent would not lay its fibrous covering directly upon the insulating material because the insulating material is forced into the first covering and the surplus removed?

A. If the insulating material is scraped off so that the first covering is exposed, then the second covering will rest upon the first covering except where the second covering may touch the insulating machine that fills the spaces between the first covering.

68 72 X Q. In your opinion does a proper interpretation of the Cowles patent require that the second layer of fibrous covering should be laid directly upon the insulating material—that is, the paint?

A. Yes; not only upon, but into.

73 X Q. Would the introduction between the bath containing paint and the second braiding machine in the process of the Cowles patent of a "conical die," which presses the insulating compound into the first fibrous covering and which at the same time took off the surplus material—I mean such a die as is described in English patent Henley—prevent the process from being the Cowles process and the resultant product from being the Cowles product?

A. Under the circumstances inquired about very different conditions would exist from those in the Henley English patent. In said Henley patent the die will necessarily tend to chill the hot compound. If such a die was used with paint there would be no chilling action.

If a die was used in the Cowles machine, and it only took off superfluous paint, the presumption is that it would leave upon the first coating the amount of paint required to fill the interstices between the first and second coating and to cause the second coating to adhere to the first. Under those conditions the conical die might cease to be an injury, but under all circumstances it would be entirely superfluous and could do no good. Its introduction in the manner suggested by the question would, in my opinion, be a palpable effort at evasion of the Cowles patent.

In the manner in which I have suggested in my answer, and which comes within the scope of the question, my opinion is that the process would be the Cowles process and the product the Cowles product.

74 X Q. Is it necessary, in your opinion, for the proper insulation of wire by means of the Cowles process that the insulating compound should in some manner be pressed into the first fibrous covering?

A. It is necessary, in my opinion, that the second covering

69 be applied upon the paint while that paint is in a condition for the second covering to imbed itself into the paint, and this cannot be done without the paint thereby being forced into

the first covering. It is not necessary, in my opinion, that the insulating compound should be pressed into the first fibrous covering in some other manner than by the application of the second covering.

75 X Q. Please note that in my last question, No. 74, that I did not ask anything about the second covering nor about the manner in which the insulating material should be forced into the first covering, but simply if, in your opinion, for the proper insulation of wire by means of the Cowles process it was necessary that the insulating compound should be pressed in some manner into the first fibrous covering. Will you now please answer that question?

A. The very indefinite character of the question required the answer which I gave in order to be correct. I do not find in the Cowles patent anything to intimate that a separate or specific operation is performed of forcing the paint into the first covering. As a necessary consequence of the process of manufacturing the paint is forced into the first covering, and to that extent it is necessary that the insulating compound should be pressed into the first fibrous covering.

76 X Q. By the expression "as a necessary consequence of the process of manufacturing" do you mean to be understood as saying that this consequence follows necessarily from any process of manufacturing or necessarily from manufacturing by the Cowles process?

A. I meant to be understood as saying that the second covering in the Cowles process could not be applied to the paint without the paint being forced into the first covering as a necessary consequence of the manufacture according to the Cowles process.

77 X Q. What is it in the Cowles process that forces the insulating material into the first fibrous covering?

A. As the threads are laid together in the 2d braiding operation they form an open-work envelope outside of the paint, and this covering being drawn tightly upon the paint applies a pressure thereto, which forces the paint into the first covering.

78 X Q. It is, then, is it not, the 2d fibrous covering and the 2d fibrous covering alone that exerts all the power that is used in the Cowles process for forcing the paint into the first fibrous covering?

A. No. Before the paint on the first covering arrives at the second covering such first covering has passed through the bath of paint, and the column of paint has exerted a certain amount of pressure to force the paint against and into the first covering.

79 X Q. It is, then, is it not, the second fibrous covering and the weight of the column of paint together which exert all the power that is used for forcing the paint into the first fibrous covering?

A. That is all the external force. The first fibrous covering has a capillary action inherent to itself which tends to draw in the paint.

80 X Q. And, if I understand you correctly in your answer to cross-question 75, this is "a necessary consequence of the process of manufacturing"?

A. The forcing of the paint is a necessary consequence of the process of manufacturing.

81 X Q. Then the forcing of the paint into the first covering of fibrous material on a wire insulated by the Cowles process is a necessary consequence of the process of manufacture and is in no sense a part of the novelty claimed in the Cowles patent as being the patentee's invention?

A. I have said no such thing. If the inventor has brought together certain successive operations to form as a whole a novel process he is entitled, in my judgment, to patent that process and to reap the benefits therewith connected, whether one feature of benefit is incidental or not, and if the article made by their process is superior in consequence of something that is inseparable from that process, and the article, as in this instance, be distinguished from pre-existing articles, then, in my judgment, the inventor should be protected in the article, even though one feature thereof may exist as a consequence of the process of manufacture.

71 82 X Q. Is the forcing of the paint into the first covering of fibrous material on a wire insulated by the Cowles process necessary to the manufacture of the Cowles product? Please answer that question categorically. If you wish to add any explanation your counsel can give you the opportunity on your redirect examination.

A. That question cannot be answered categorically because it relates both to the process and to the product. The Cowles patent has two claims. In the first one, which relates to the process, the forcing of the paint into the first covering of fibrous material on the wire is a necessary part of that process. The second claim in the Cowles patent relates to the product which is also inquired about in the question, and it might not be apparent on inspection whether the paint had been forced into the first covering or not, and the second claim in the Cowles patent is silent on the point inquired about.

83 X Q. Am I to understand from your last answer that if one piece of insulated wire had the paint forced into the first fibrous covering such wire would be made according to the second claim of the Cowles patent; whereas if a piece of insulated wire had not the paint forced into the first fibrous covering it might not be an infringement of the same claim, both pieces of wire, it being assumed, having the second fibrous covering?

A. If counsel will inform me how it is possible to apply the second layer of fibrous covering so that the paint which intervenes between the layers and fills the interstices of the covering as required by the second claim could be applied without the paint being forced into the interstices of the first covering I will take pleasure in answering the question.

84 X Q. Please, now, answer X Q. No. 83.

A. It inquires about a condition which I cannot understand to possibly exist, and to answer a question under such circumstances is likely to involve an error, which it is my desire to avoid.

I cannot see how the insulated wire could be made that
72 did not have the paint forced into the first fibrous covering.
I have referred to three forces that tended to press the paint into the first covering when the wire is made according to the Cowles patent, viz., the weight of the column of paint, the capillary action, and the braiding. The paint could not be applied to the first covering under any circumstances that I know of without one of these forces tending to force the paint into the first fibrous covering.

The question cannot be answered correctly, because it presumes that no force had been exerted to drive the paint into the first fibrous covering.

85 X Q. Then, if I understand your last answer, if a piece of wire should be run through a braider, then through a paint pot or vat, and the operation should stop there, more or less of the paint would necessarily be forced into the first fibrous covering. Do I rightly so understand you?

A. That is correct; and in my judgment the Cowles patent does not relate to that one operation separately considered.

86 X Q. So that it was not new at the date of the Cowles patent, and could not have been new to force the paint into the first covering of fibrous material. Is that so?

A. It was not new at the date of the Cowles patent to force the paint into the first covering by the column of paint or by the capillary action.

87 X Q. Did Mr. Cowles invent or discover any new or third method or force for pressing the paint into the first fibrous covering?

A. In my judgment he did when he applied the second covering in the form of threads braided or wound directly upon the paint that was upon the surface of the first covering while that paint was in an unset condition.

88 X Q. Do you mean to say that this new discovery or invention of Mr. Cowles is a new or third method or force for pressing the paint into the first fibrous covering? If possible, please answer this question categorically.

73 A. What I mean to say is that there were two forces acting on the paint to press it into the first fibrous covering before the third force was exerted by the threads braided or wound directly upon the paint, and that Mr. Cowles, as far as I know, was the first person that availed of this third and additional force to render more perfect the insulated covering of the wire.

89 X Q. Is it essential to a proper understanding and operation of the Cowles patented process that the third force that you have described should be used for pressing the paint into the first jacket of fibrous covering in conjunction with the two other forces that you have mentioned?

A. This third step or force, in my judgment, is inseparable from the process to which the first claim of the Cowles patent relates, but I do not consider that that claim is limited to the use of the other two forces, because a column of paint might be dispensed with if the paint was laid on by a brush by hand, and this claim in the

Cowles patent would relate to the method made use of so long as the second layer of fibrous material was laid upon the paint before it dries or sets.

90 X Q. Do you mean by your last answer to say that it would make no difference how the paint was forced into the first fibrous covering "so long as the second layer of fibrous material was laid upon the paint before it dries or sets"?

A. The capillary force is always present. The rubbing action of a brush would, in my judgment, work the paint into the first fibrous covering as much as the pressure of a column of paint, and I do not think it would make any difference how the paint was forced into the first layer before it was presented in an undried condition to the second layer. The winding on of the second layer would perfect the operation of forcing the paint into the first layer.

91 X Q. If the second layer of fibrous material should be laid on so lightly and loosely upon the paint as to exert no possible pressure upon it, and the wire should be then taken out and dried, would that method produce an insulated wire after the Cowles process?

71 A. The question involves an impossibility. If it was possible I should say no. In the very act of winding on the thread a pressure is necessarily exerted.

92 X Q. Assuming that only that pressure was exerted which is necessary from "the very act of winding on the thread" and the wire should be then taken out and dried, as in the last question supposed, would that method produce an insulated wire made after the Cowles process?

Objected to as ambiguous and indefinite by counsel for complainant.

A. In my judgment it would, because as soon as the thread comes in contact with the paint upon the surface of the first covering the oil is absorbed and the particles of metallic carbonates or oxides adhere to the surface of the thread and the tension necessary in winding on the thread presses these very particles into contact with the first fibrous covering, the tension necessary in winding on the thread being sufficient to produce the contact of the metallic particles with the threads of both coverings.

93 X Q. So it is true, is it not, if you are right in your last answer, that under no circumstances could a second layer of thread of fibrous material be laid upon an electric conductor that had previously had braided or wound upon it a fibrous covering or jacket and then been passed through a bath of white lead or zinc paint and while the same is in an undry or unset condition without producing an insulated wire made after the Cowles patent?

A. My judgment is that according to the question an article would be produced according to the Cowles patent, providing that the first covering was of threads that had not been previously filled with some material that would prevent the paint penetrating the same.

Redirect by Mr. PUSEY:

94 Re-D. Q. What do you understand to be the meaning
75 of Henley in his specification at the places where you have been asked to read, as in cross-questions 61, 62, and 63?

A. Mr Henley does not state very concisely what he means by a separate operation.

Taking the specification as a whole, especially the second claim, I understand that the several coatings of composition and fibrous materials are being applied upon different parts of the same wire at the same time, and that he considers this preferable to covering the wire by operations that are so distinct and separate that the wire has to be coiled between one operation and the next. I do not discover anything to indicate that one operation performed in the Henley machine is a part of any other operation. In other words, each operation would be distinct and complete if nothing but that one operation was performed,

95 Re-D. Q. What would be the effect of leaving off the conical die in the Henley patent 1126 of 1864?

A. The bituminous or resinous material would adhere to the fibrous covering, and would not be uniform in thickness, and would be more or less in lumps when the same reached the second braiding operation, and in consequence of the wire with the resinous material passing around a roller or extending into a floor above before reaching the winding machine the resinous material would be so hardened and chilled that the threads wound upon the same would not imbed themselves with the resinous material or gutta-percha spoken of as the insulating material and the covering would be irregular and lumpy.

Recross by Mr. SEYMOUR:

96 Re-X Q. The irregular and lumpy character which you describe in your last answer would be owing to the character of the insulating material used, would it not?

A. Principally to the character of the material, because the same had to be in a melted condition and being comparatively
76 small in bulk when upon the conductor it loses its heat and hardens almost immediately upon leaving the vat.

LEMUEL W. SERRELL.

Affirmed and subscribed before me this 13th day of January, 1887.

GEO. T. PINCKNEY,
[SEAL.] *Notary Public, Kings Co.*

Cert. filed in N. Y. Co.

Counsel for complainant offers in evidence a copy of a certain letter from the Brush Electric Company to the Ansonia Brass and Copper Co., dated Dec. 9, 1880, which letter is referred to in the testimony of Alfred A. Cowles, to which offer defendant's counsel does not object. Said letter is marked "Compiainant's Exhibit Brush Letter."

77 DECEMBER 1ST, 1886.

THOMAS A. EDISON, a witness produced by and on behalf of the complainant, in answer to interrogatories propounded by JOSHUA PUSEY, Esq., of counsel for complainant, testifies as follows:

1 Q. Please state your name, age, residence, and occupation, and also whether you are familiar with, and, if so, what experience you have had in relation to, the construction and operation of mechanism and appliances in connection with conductors of electricity, and particularly with electric lightning.

A. My name is Thomas A. Edison; age, 39 years; residence, Orange, New Jersey; occupation, inventor. I am familiar with the state of the art in relation to electric conductors and the mechanism and appliances in connection therewith, and particularly with electric lighting, and during the past eight years I have made a large number of inventions on this subject and patented the same.

2 Q. You have given very considerable attention to the subject of applied electricity and particularly to electric lighting for many years past?

A. Yes, sir.

3 Q. You have had occasion to acquaint yourself with and to practically use conductors for electric lighting?

A. Yes, sir.

4 Q. How were the wires for that purpose covered or insulated?

A. The wires for the inside of houses were cotton covered and soaked in paraffine; also wires with cotton covering permeated with paint.

5 Q. You are speaking of those which you have practically used for inside use, I presume. What difference is there between such wires for inside use, as you have termed it, and outside use?

A. It is essential that wires for inside use should not have their insulating coating inflame, as it frightens the consumer, is not permitted by the fire insurance company, and in some cases sets
78 fire to material adjacent to the wires when by accident powerful currents pass through the copper wire. This is not so essential in wires strung in the open air, that the covering should be non-inflammable.

6 Q. About when did you begin to use electric lighting wire?

A. In large quantities in 1881.

7 Q. When did you first begin to use it in smaller quantities, experimentally or otherwise?

A. In 1878–1879 we used the ordinary paraffine cotton-coated wire, then the only wire generally used for inside wiring for telegraphs, etc.

8 Q. Was any difficulty experienced in or objections to the use of the paraffine-coated wire in electric lighting; and, if so, what?

A. Yes; where the wire became crossed the paraffine would become inflamed, melt, and drop on the floor while still burning.

9 Q. Do you speak from practical experience as to this or general reputation?

A. From practical experience.

My first experience with paraffine wire was at Menlo Park in the fall of 1879. All the buildings of the laboratory and four houses were wired with paraffine wire. Fusible safety catches were not used at that time except on the dynamo.

We had several crosses.

The wire along the ceiling became red hot, melted, and set fire to the paraffine, which would run along the lowest point of the wire and drop off on the floor or carpet while still burning. To obviate this we interpolated in the circuits running through the house fusible safety wires to prevent the copper wires from reaching such a temperature as to inflame the insulation.

10 Q. After you had used this paraffine-coated wire and thus learned its dangers or defects, did you subsequently make a change in the electric light wire that you used; if so, what and when?

A. We did not at first, because we thought the safety
79 catches would render the use of any wire safe; but some time in 1882 we found that there were conditions whereby the safety catch did not protect.

We had put a large amount of wire up in New York inside of buildings all paraffined and safety-catched; but, notwithstanding this, we had cases where the wire was inflamed, and soon after we commenced to use the paint-permeated wire of Mr. Cowles. My impression is that the board of fire underwriters ordered us to take all the paraffine wire out and substitute a non-inflammable insulated wire.

11 Q. How did you find the Cowles wire to work?

A. It did not inflame. The insulation merely oxidized. It worked satisfactorily.

12 Q. Have you continued ever since to use the Cowles wire; and, if so, in what quantity—that is, in large or small quantity?

A. We have used it ever since in very large quantities.

— Q. Did you know, when you commenced to use the Cowles wire, and do you know now, any other wire for electric lighting that will serve the purpose for inside uses?

A. None that was uninflammable.

14 Q. Have you read and do you understand letters patent No. 272,660, dated February 20, 1883, granted to Alfred A. Cowles?

A. Yes.

15 Q. Is Alfred A. Cowles the person whose wire you used as stated by you?

A. Yes, sir.

16 Q. Was that wire made according to the said patent?

A. Yes.

17 Q. Have you a knowledge of the state of the art with relation to the covering and insulating of electric conductors that preceded the Cowles invention, and have you examined or referred to the testimony of defendant's expert, John E. Earle, with relation to the British patents mentioned therein?

A. I had a general knowledge. I have only looked over Mr. Earle's testimony for a few minutes.

80 18 Q. State whether or not in your opinion, in view of such state of the art and what you understand as to the said British patents, the Cowles invention, as described and claimed in his patent, is a real and important improvement.

A. I think it is for electric lighting purposes.

19 Q. You have taken out a great many patents and have had a good deal to do with patents and inventions. State whether or not in your opinion the improvements described and claimed in the Cowles patent embodied invention or required the use of inventive faculty to produce the same.

Question objected to by counsel for defendant as both leading and immaterial.

A. Yes.

20 Q. What is the effect of passing a very heavy current of electricity through the wire covered according to the Cowles patent—I mean the practical and chemical effects?

A. If the temperature is sufficiently high the cellulose of the cotton is decomposed, water is given off, and carbon produced. This is oxidized to carbonic oxide. This reduces the lead to a metallic state and carbonic acid goes off. Nearly the same reaction takes place with a film of linseed oil. None of the ingredients melt except, perhaps, the metallic lead. The practical effect is that no flame springs from the wire, and the carbon is consumed by slow oxidation, like tinder.

21 Q. In answer to interrogatory 10 you stated that in, some time in, 1882 you had put a large amount of wire in New York inside of buildings which was paraffined, and that afterwards you commenced to use the *the* Cowles wire. Please state when *yot* first began to use the Cowles wire in any way in your business.

A. I think we used it in the insulated business for inside purposes in the fall of 1881.

22 Q. Please state, as nearly as you can, when Mr. Cowles first called you- attention to his improved wire.

A. In the summer of 1881.

81 23 Q. State whether or not, in your opinion, wires covered with a fibrous coating and saturated with gutta-percha, bitumen, India rubber, and resins would be suitable for electric-lighting purposes.

A. Decidedly not.

24 Q. Please give your reasons for this.

A. They would melt, be decomposed by the heat, and the wire would become inflamed.

THOS. A. EDISON.

Sworn to before me this 21st day of December, 1886.

GEO. T. PINCKNEY,
Notary Public, Kings Co.

Cert. filed in N. Y. Co.

(Pp. 82, '3, '4, '5, '6, & '7 missing.)

88 NEW YORK, N. Y., *Dec.* 13, 1886.

Met pursuant to adjournment.

Counsel present as before.

FRANK G. STONE, a witness produced by and on behalf of the complainant, being duly sworn, in answer to interrogatories propounded by C. E. MITCHELL, Esq., of counsel for complainant, testifies as follows:

1 Q. Please state your name, age, residence, and occupation.

A. Frank G. Stone; age, 25 years; residence, New York city; occupation, salesman in the employ of the Ansonia Brass and Copper Co.

2 Q. Are you familiar with the electric lighting wire manufactured and sold by said Co.?

A. I am.

3 Q. Have you read the testimony of John E. Earle, defendant's expert in this case, and have you read and do you understand the several letters patent to which his testimony relates?

A. I have read said testimony and said patents and understand the same.

4 Q. Say whether you have caused to be prepared, to be used as exhibits in this case, specimens of the various articles described in said letters patent and referred to by Mr. Earle in his said testimony.

A. Yes, sir. They were made partly by myself and partly under my direct supervision.

5 Q. By whose suggestion were said specimens made?

A. By suggestion of Mr. A. A. Cowles.

6 Q. Where were said specimens produced?

A. The majority of them were made in Ansonia, Connecticut, at the factory of the Ansonia Brass and Copper Company. One sample was made in New York.

7 Q. If you have said specimens with you, will you please produce the same?

89 A. I have them with me and hereby produce them.

Counsel for complainant places in evidence the specimens produced by the witness, and they are severally marked as follows (the initials of the notary being added):

(No. 1.) Complainant's Exhibit Brown & Williams Sample English Pat. 12991, 1850.

(No. 2.) Complainant's Exhibit John Wallace Duncan Sample No. 1, English Pat. 906, 1853; also John Wallace Duncan Sample No. 2, English Pat. 906, 1853.

(No. 3.) Complainant's Exhibit Felix Marie Baudouin Sample No. 1, Baudouin English Pat. 933, 1857; also samples 2, 3, and 4 of same, similarly marked.

(No. 4.) Complainant's Exhibit W. H. Horstmann Sample No. 1, English Pat. 434 of 1859; also sample No. 2 of same, similarly marked.

(No. 5.) Complainant's Exhibit Charles William Siemens Sample

No. 1, English Pat. 464, 1863; also sample No. 2 of same, similarly marked.

(No. 6.) Complainant's Exhibit William Thomas Henley Sample No. 1, English Pat. 1126, 1864; also sample No. 2 of same, similarly marked.

(No. 7.) Complainant's Exhibit Jolourcau & Lardy Sample English Pat. 2942, 1867.

(No. 8.) Complainant's Exhibit Joseph Rogers Sample English Pat. 3314, 1870.

(No. 9.) Complainant's Exhibit George Frederic James Sample English Pat. 1333, 1880.

(No. 10.) Complainant's Exhibit Charles West Sample No. 1, English Pat. 2321, 1858; also sample No. 2 of same, similarly marked.

(No. 11.) Complainant's Exhibit Chatterton & Smith Sample English Pat. 2056, 1860.

(No. 12.) Complainant's Exhibit Chatterton & Smith Sample No. 1, English Pat. 175, 1861; also samples 2 and 3 of same, similarly marked.

90 (No. 13.) Complainant's Exhibit Alfred Foucaut Sample English Pat. 2008, 1869.

(No. 14.) Complainant's Exhibit Henry Highton Sample No. 1, English Pat. 2547, 1872; also samples 2 and 3 of same, similarly marked.

(No. 15.) Complainant's Exhibit Alexander Wilkinson Sample No. 1, English Pat. 3083, 1873; also samples 2 and 3 of same, similarly marked.

(No. 16.) Complainant's Exhibit Thomas Walker Sample No. 1, English Pat. 274, 1870; also samples 2 and 3 of same, similarly marked.

(No. 17.) Complainant's Exhibit Bálestrini Sample English Pat. 2124, 1856.

8 Q. Please examine the several samples which were produced by you and have been placed in evidence and say whether or not they were produced by following the directions contained in the patents whose numbers and dates are contained upon the tags affixed to them severally and respectively.

A. Yes; they were to the best of my ability with the facilities and materials at my command

In referring to Eng. pat. 464 of 1863 of Charles William Siemens the patent states that pure liquid gutta-percha or India-rubber juice is applied to the wire in its natural state—that is, just as it comes from the trees.

I was unable to obtain this, so substituted in its place pure gutta-percha dissolved in bisulphate of carbon.

9 Q. Please explain why you in several instances have produced more than one specimen as made under one patent.

A. The reason I produced more than one sample is because that in several instances the patents stated that the wire was to be insulated in a certain manner and with a certain insulation, or that the insulation or manner of applying could be changed, thus giving two or more ways of insulating the wire in one patent.

10 Q. Please explain how you produced the specimen under the Brown & Williams patent.

91 A. The sample of Brown & Williams' patent is made in the following manner:

First take a piece of bare copper wire and cover this with a braiding of yarn. Saturate this with gutta-percha. A second braiding of yarn is afterward applied to the wire, and this is saturated with vegetable pitch. The wire was covered the last time with jute, which was the nearest substance I could get to the "coir" mentioned in the patent. This covering was saturated with mineral pitch, namely, bitumen.

11 Q. Please explain how you produced the John Wallace Duncan samples.

A. The samples on this patent were made in the following manner: First, made a compound composed of 40 parts of gutta-percha, 3 parts of caoutchouc, 3 parts of shellac, 14 parts of Canada balsam, 35 parts of liquid styrax, 4 parts of gummastic, and one part of oxide of lead. This was heated in the manner described in the patent and thoroughly masticated, and while in a plastic condition molded onto the wire by hand.

Sample No. 2 has a slip of cloth cemented to the insulation by heating it slightly, the seam running longitudinally, as stated in the patent.

12 Q. Please continue such explanations as to the remaining samples in regular order.

A. Referring to Eng. pat. No. 933 of 1857, Baudouin patent, the sample No. 1 is made in the following manner:

First, clean the wire and pass it through hot bitumen; 3 windings of tape applied to the wire, each saturated with hot bitumen.

In speaking of the combinations, sample No. 2 is made in the following manner:

First, a coating of bitumen on the surface of the wire; second, a covering of cotton saturated with bitumen; third, a strip of gummed taffetas or, what I used in this case, a strip of cotton saturated with rubber, which is known as "rubber tape."

A second covering of tape saturated with bitumen is then applied to the wire and the wire is covered the last time with dry tape.

92 Sample No. 3 is the same in every respect as sample No. 2, only a covering of strong hemp is substituted in place of the dry tape.

Sample No. 4 is also made in the same manner as sample No. 2, substituting for the last covering a narrow band of waxed cloth.

Referring to English patent No. 434, of 1859, William H. Horstmann, the bare copper wire is first sand-papered and passed through a solution of gum lac. It is then covered with muslin tape and passed through a mixture of resin, with enough tar added to make it pliable.

A second covering of muslin tape was then applied, and a second coating of the resinous compound was then applied, and then a covering of tape was applied.

The wire thus insulated forms one of the conductors in a cable.

In the single strand, sample No. 2, I substituted for the third covering gutta-percha, as stated could be used in the patent.

Two strands insulated in the manner described were joined together and bound with yarn double wound in opposite directions. Two iron wires were then introduced and bound into the cable by two windings of yarn in opposite directions as before.

The cable thus insulated I passed through a composition of tar and resin and wiped smooth.

Referring to English patent 464, of 1863, Charles William Siemens, I first covered the wire with a winding of cotton and then passed it through gutta-percha in solution, drying the wire and repeating this operation until sufficient insulation had been applied. I next wound on a winding of dry hemp in sample No. 1.

Sample No. 2 was made in the same manner, except that it received a winding of hemp saturated with gutta-percha, and before this was dry I wound on a winding of dry hemp in opposite directions.

The special feature in this patent was the application of gutta-percha or India-rubber juice just as it comes from the trees; but, as I could not obtain this, I substituted pure gutta-percha dis-
93 solved in bisulphate of carbon, which I believe to be a near approach to the liquid gutta-percha juice.

Adjourned to Tuesday, Dec. 14, 1886, at 10 a. m.

G. T. P., *Notary.*

NEW YORK, *December* 14, 1886.

Met, pursuant to adjournment, 10 a. m.

Counsel present as before.

Continuation of testimony of Mr. F. G. STONE:

(12 A. continued.) Referring to English patent 1126, of 1864, William Thomas Henley, sample No. 1 was prepared as follows:

I first passed the wire through a composition of linseed oil and resin, heated, and I then wound on a covering of dry cotton yarn.

I passed the covered wire through the composition again and wound on another covering of dry cotton and applied a last covering of dry tape.

Sample No. 2 of Henley patent 1126 of 1864 was prepared in the same manner, with the exception that I substituted tape in place of the two windings of cotton.

Referring to Joloureau & Lardy English patent 2942 of 1867, I first covered the wire with bituminously prepared twine and then applied several coverings of bituminously prepared paper, as stated in the patent, and finally applied a winding of twine as before and then a layer of bitumen, which latter was sanded all over.

Referring to Rogers' English patent 3314 of 1870, the sample of this was made in the following manner:

I first wound the wire with cotton and saturated it with
94 gutta percha and applied a second covering of cotton and gutta-percha in the same manner, finally dusting the wire over with chalk.

Referring to James English patent 1333 of 1880, the description of this patent is for the machine only.

In this sample I used gutta-percha as the insulating material, as that was a well-known insulating material, and no special insulating material was spoken of.

I first applied two windings of cotton, in opposite directions, saturated with gutta-percha, and while this remained green passed it through a braiding machine and put on a covering of dry cotton.

Referring to West's English patent 2321 of 1858, sample No. 1 I made as follows:

The wires were first covered with India rubber, as stated in the patent. They were then bound together in the form of a cable by a winding of hemp saturated with a composition of carbonate of lead mixed with oil. The patent states that he prefers to use a solution as Peacock's & Buchan's compound for ships' bottoms, but of course I could not procure this. I then applied a braiding of yarn and saturated this with a compound of carbonate of lead, just referred to.

Sample No. 2 for this patent was made in the same manner with the exception that a single wire was used in place of the several conductors in the cable.

Referring to Chatterton & Smith English patent 2056 of 1860, the wire was first coated with gutta-percha. I then wound around this tape saturated with oxide of lead mixed with varnish, and finally applied a binding of uncoated tape exterior of the saturated coatings of fibre.

Referring to Chatterton & Smith English patent 175 of 1861, the wire is first insulated with gutta-percha. I then applied a winding of tape saturated with red lead and Stockholm tar.

On sample No. 1 I put on two windings of saturated tape and a dry piece of tape exterior to the saturated covering.

Sample No. 2, which is made in the form of a cable, I constructed as follows:

95 I took three gutta-percha insulated wires and wound them with tape saturated with the composition first spoken of, and twisted them together in the form of a cable and wound around them a coating of dry tape. This was to form the inside core of the cable. I then took several iron wires and wound them with tape saturated with the compound before mentioned, and while they were green or in a moist condition laid them spirally around the inside core of insulated copper wire.

Sample No. 3 is one of the individual copper wires in the cable, showing the style of insulation.

Referring to Foucaut English patent 2008 of 1869, the sample was made in the following manner:

I first took three copper wires insulated with gutta-percha, and then applied a winding of cotton thread saturated with a cerus- of carbonate of lead, litharge oil, and sawdust. I then wound around each of those wires a narrow strip of tin-foil, and bound the three together with a winding of tape saturated in the cerus, before men-

tioned. I then applied a winding of tarred rope, and finally a winding of tarred cloth.

Referring to Highton English patent 2547, of 1872, sample No. 1 was made by taking a gutta-percha wire and painting it with red lead mixed with boiled oil. Sample No. 2, in place of the red lead and boiled oil I used a composition of red lead, oil, and tar.

Sample No. 3 I made by taking a gutta-percha wire, passing it through a mixture of tar and oil, and, while it was green or wet, dusting it over with red lead.

Referring to Wilkinson English patent 3083, of 1873, sample No. 1 was made in the following manner: I first took gutta-percha insulated wire, applied a winding of jute, saturated with the following ingredients:

White lead, 1 lb.; pitch, 4 oz.; japan, 1 oz.; shellac, 3 oz.; tallow, 1 oz.; naphtha, 1 oz.; linseed oil, 1 oz. Mixed gradually under action of heat.

After applying this winding of fiber saturated as above it was exposed to the air and allowed to dry, and then passed through a second similar bath of composition only, and finally through a bath of white lead.

96 Sample No. 2 was made in the same manner, with the exception that I used a strip of cloth in place of the winding of jute.

Sample No. 3 was made by taking a gutta-percha wire and winding it with jute saturated in a mixture of white lead, boiled oil, and gutta-percha, and then passing the sample through this same composition, and finally through a composition of white lead.

Referring to Walker's English patent 274 of 1870, this patent describes a composition for coating copper wire, and in sample No. 1 I used gutta-percha in solution mixed with resin, pitch, bitumen, paraffine, lamp-black, and fine sand.

Sample No. 2 I made with a composition of the above ingredients and an admixture of paint, using white lead.

Sample No. 3 was made of the ingredients referred to, leaving out the gutta-percha.

Referring to Balistrini's English patent 2124 of 1856, I first covered the copper wire with hemp cord saturated with a mixture of India rubber and pitch, and this was afterwards painted outside with zinc white.

13 Q. If you are familiar with the patented wire made under the Cowles patent in this suit, and if you have samples of the same, can you produce them?

A. Yes, sir; I am familiar with the wire made under Mr. Cowles' patent, and hereby produce samples.

14 Q. How long have you been salesman or order clerk for the complainant?

A. To the best of my recollection I held the position of order clerk from early in the spring of 1881 until the spring of 1883, when I took the position of salesman.

Samples of wire referred to by witness put in evidence by coun-

sel for complainant and marked "Complainant's Exhibit Cowles Wire No. 2."

15 Q. Have you been in the employ of the plaintiff continuously as order clerk or salesman since early in 1881?

97 A. Yes; in those capacities. I entered the employ of complainant in the fall of 1879.

16 Q. Since what time have the plaintiffs furnished the market with non-combustible insulated copper wire, like Exhibit Cowles Wire No. 2?

A. I know that the wire was furnished in large quantities early in 1881, and that it superseded the paraffine wire that had been largely in use up to that time.

17 Q. If there is any fact which fixes this substitution in your mind, you may give it.

A. I know that we had a large stock of paraffine wire on hand in our New York warehouse, and that we tried ineffectually to dispose of it; being unsuccessful in disposing of the wire, we returned it to the factory to have the insulation burned off, so as to save the copper wire.

18 Q. Can you state the time when the plaintiff gave up trying to dispose of the paraffine wire and sent it back to the factory in the way you have stated?

A. To the best of my recollection the wire was returned the latter part of the year 1881 or first part of 1882.

19 Q. Have you a sample of the paraffine wire, such as was used before the introduction of the Cowles wire?

A. I have, and produce the same.

Sample introduced in evidence and marked "Complainant's Exhibit Paraffine Wire."

FRANK G. STONE.

Cross-examination by M. W. SEYMOUR, Esq., counsel for defendant:

20 X Q. In your direct testimony you have stated that you entered into the employment of the complainant in 1879. At that time you were 18 years of age, were you not?

A. I was.

21 X Q. What had been your occupation the four or five years previous to that date?

98 A. I had been at school in Newburyport, Mass., at the Brown high school, taking the scientific course of that institution.

22 X Q. Have you ever had any practical experience in making electrical conductors? And, if yea, state what, when, and where.

A. I have had a practical experience in describing how goods, including electrical conductors, should be manufactured, as I stated in my testimony that I had held the position of order clerk for about two years, ordering all the goods that we manufactured on special orders to the factory.

23 X Q. Taking English patent No. 464 of 1863 at random, from

the reference made in this case, please examine the exhibits put in evidence by you, and state what the fibrous materials made use of by you as insulators are.

A. The fibrous materials are cotton, thread, and hemp.

24 X Q. I notice that Mr. Siemens, in his patent, says: "I cover the naked wire or strands of wires first with a layer of silk, cotton, or other fibrous material in the usual way." Why did you select cotton and hemp?

A. I selected cotton for the first winding, as it was more convenient for me in preparing the samples. The hemp was used on the outer coverings on the wire, as stated in the patent, and I considered it was a non-essential difference between using silk and cotton.

25 X Q. Is it true that hemp is the only fiber mentioned for the outer covering?

A. The patent stated hemp or other fibrous material; therefore I used hemp.

26 X Q. And is it or is it not true that what you did in preparing the Siemens exhibit you did in the preparation of the other exhibits which you have put in evidence in this case, viz., that you selected that material which was most convenient for you in preparing the samples, exercising your best judgment as to what were or were not essential differences in the substances named in the various patents?

99 A. I selected the material which I thought would most closely conform with the requirements stipulated in the patents. When two substances were named, such as in the patent referred to, viz., silk and cotton, I used my best judgment, all things considered, in regard to the selection.

FRANK G. STONE.

Subscribed and sworn to before me this 14th day of December, 1886.

GEO. T. PINCKNEY,
Notary Public, Kings County.

Cert. filed in N. Y. Co.

Adjourned.

G. T. P., *Notary.*

NEW YORK, *Dec.* 15, 1886

ALFRED A. COWLES, a witness produced by and on behalf of the complainant, being duly sworn, in answer to interrogatories propounded by CHAS. E. MITCHELL Esq., of counsel for complainant, testifies as follows:

1 Q. Please state your name, age, residence, and occupation.

A. Alfred A. Cowles; age, 41 years; residence, New York city; occupation, secretary of the Ansonia Brass and Copper Co.

2 Q. Are you the Alfred A. Cowles to whom letters patent upon which this suit is brought refers?

A. I am.

3 Q. When did you first conceive of the process and product described and claimed in such letters patent?

A. In December, 1880.

4 Q. Have you any means of fixing that date by association with any writing?

A. I have.

100 5 Q. What was the writing? And state how it enables you to fix the date.

A. The writing is a letter which I received from the Brush Electric Co., of Cleveland, Ohio, dated Dec. 9, 1880, requesting me to apply a heavier coating of paint upon the wire which we were furnishing them.

Shortly after the receipt of this letter I began to experiment and to devise various methods of insulating wire by the use of paint and fibrous material.

6 Q. Have you the letter?

A. I have not the original, but I have a copy taken from the original by me, and in that original and in this copy is the following:

"We would like to have this wire more heavily covered with paint than what you have sent us, as otherwise it does not answer for insulation when the weather is wet."

7 Q. The passage from the Brush letter speaks of or refers to the wire you had sent them. What was that wire?

A. It was a copper wire, covered first with a double winding of cotton, then painted on the outside of the covering.

8 Q. Say whether or not you received any order for wire in the letter of December 9, 1880, and, if so, what it was.

A. We received an order from the Brush Electric Co., of Cleveland, dated December 9, 1880, for one thousand feet of copper wire, .165 diameter, double wound with cotton and painted heavily upon the outside.

9 Q. You have spoken of the experiments which you entered upon after the receipt of the Brush letter in order to secure a heavy coat of paint. Please describe them, stating what difficulties you met and how you finally overcame the difficulties.

A. The defect mentioned in the Brush letter I found to be very difficult to overcome. In filling their order I could devise no better means than to put on a very heavy coating of paint outside of the cotton covering. This I did by causing the paint to be made

101 very thick, but I found when the paint was applied in this manner the coating of paint was not uniform or even, and, furthermore, when the wire was bent at a sharp angle or subjected to abrasion the paint was liable to crack or flake and peel off, thus rendering the insulation defective. In the latter part of December, while at our factory at Ansonia, I took several pieces of wire which were covered with fibrous material wound upon the wire. These pieces I dipped in paint, and then, while the paint was fresh upon the fibrous coating, I applied another coating of fibrous material in the form of thread by winding it upon the paint. This, I observed, kept the coating of paint upon the wire, distributed it evenly and

at the same time, by the act of winding the thread upon the paint, the paint was forced into the interstices of both the coverings of thread, thereby securing a better insulation than I had before made.

10 Q. Say when you first made samples of the patented wire with a view of placing the article upon the market.

A. After preparing the samples of which I have spoken, I think I made others during the winter of 1880–1881, and in the spring of 1881 I submitted samples of the wire prepared in accordance with the patent of some of our customers with a view of taking orders from them.

11 Q. When did you first manufacture the patented wire for the market? I mean when did the Ansonia Brass and Copper Co.?

A. We took orders for the wire in large quantities in the month of May, 1881, and manufactured the wire at that time.

12 Q. Have you any writing enabling you to fix that date or aiding you to do so?

A. I have.

13 Q. Please produce the writing and say what it is.

A. I here produce the letter written by me under date of May 17, 1881, to Thomas A. Edison, the well-known inventor. This letter relates to the wire in question, and it was returned to me on the same day or on the day after it was written, with Mr. Edison's
102 endorsement, as follows: "I think we shall be able to take five ton per week. Edison."

This endorsement relates also to the wire in question.

Counsel for complainant put in evidence the letter introduced by the witness and the same is marked Complainant's Exhibit Cowles Edison Letter, May 17, 1881.

14 Q. This letter says, among other things, "I intend going to Ansonia to-morrow morning to make arrangements for increasing our facilities for covering wire, and will fit up to make any quantity you may require." Say whether you already had facilities for covering the wire by the subsequently patented method and were employing them at that date, to wit, May 17, 1881.

A. We had at that date orders for the patented wire in process of manufacture for the Edison companies, and my visit to the factory was for the purpose of increasing such facilities in order to produce the wire in larger quantities. We were at that time manufacturing the wire.

15 Q. Say whether or not you have manufactured the patented wire from that time to the present; and, if so, state to about what extent.

A. We have manufactured and sold the wire in question continuously since May, 1881, to the extent of upwards of or considerably more than two millions of pounds, or say 10,000 miles of wire.

16 Q. In which form of covering have you manufactured the wire principally, the wound or braided?

A. Principally braided. Sometimes we have applied the first covering with a texture of fibrous material by winding.

17 Q. When did you first apply the thread by braiding in manufacturing the wire in question?

A. In April or May of 1881 in large quantities, and perhaps earlier in small quantities or experimentally.

18 Q. What wire or wires were in use generally for electric light conductors at the time when you made your invention, in Dec., 1880?

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A. The wires in general use for electric lighting purposes for overhead conductors and for house wiring at that time were almost exclusively copper wires, insulated by a double braiding of cotton applied directly upon the bare wire, the wire thus covered being then immersed in a bath of melted paraffine or a compound of wax and paraffine in a heated condition, the effect being that the paraffiine soaked into the cotton.

The wire was then removed from the bath, cooled, and the surface smoothed and polished, thus making a durable but very inflammable insulation.

19 Q. What was the effects upon the sale and use of the paraffine wire of the introduction of the wire invented by you?

A. The effect of the introduction of the wire invented by me was to immediately supersede the paraffine wire generally for electric lighting purposes and so quickly to take the place of the paraffine wire that we could not dispose of the paraffine wire which we had in stock for electric lighting at the time I made my improvement. The electric lighting companies would not buy it and we had to send it to our factory and burn off the insulation to make the wire available for other purposes.

20 Q. Please explain from a practical standpoint how you succeeded in getting more paint on the wire by your new process than when the wire was first double wound and then painted as the wire was made which you had been furnishing the Brush Co.

A. When the wire is double wound and then painted and a heavy coating of paint adheres to the fibrous material, after the wire has left the bath of paint, the paint will run upon the wire so as to be thicker in some places than in others. The requirements for perfect insulation of wire are such that an uneven coating is a great defect in the insulation. Furthermore, in the process of taking the wire from the bath of paint and drying the same, the paint being in a soft condition, a portion of it will be removed from the surface at various points in handling and drying.

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Furthermore, the paint does not by this process penetrate and become incorporated with the fibrous material, but it remains on the outside, while the oil with which the paint is mixed soaks into the fibrous material.

The wire is thus covered with a coating of fibrous material soaked in oil, which is highly inflammable, while the oxides or carbonates constituting the non-inflammable portions of the paint remain upon the outside in a coating of varying thickness and in a condition in which they are liable to flake or peel off the wire by abrasion or bending.

These difficulties are overcome by my process in the following

manner: When the wire with its first covering of braided cotton passes through the vessel containing paint, the second braiding of fibrous material being applied upon the paint while the paint is still wet, the paint is distributed evenly by the action of the second braiding upon the surface of the first covering, and by the mechanical action of the second braiding the oxides or carbonates constituting the non-inflammable portion of the paint are forced into the interstices of the first covering, and at the same time the paint oozes through the threads forming the second covering, thereby coating the wire with a solid, uniform covering of non-combustible material, which acts also as an insulation, and which is held in its place by the threads of the textile material.

21 Q. How long have you been connected with the plaintiff company and how long have you been familiar with the state of the market as regards electric light conductors?

A. I have been connected with the plaintiff company continuously since 1869, and I have been acquainted with the manufacture and sale of insulated conductors for electric lighting purposes ever since the electric light was first put into practical or general use in this country.

105 22 Q. How far is the defendant's manufactory from that of plaintiff's?

A. About 200 yards.

Cross-examination by M. W SEYMOUR, Esq., counsel for defendant:

23 X Q. Previous to the date of the letter from which you have quoted, received from the Brush Electric Co., of Cleveland, you had been furnishing them with electric wire, had you not?

A. Yes.

24 X Q. That wire was insulated by the application of some fibrous covering and paint, if I rightly understood you. Is that so?

A. Some of it was, but most of it was paraffined.

25 X Q. So much of it as was insulated by the fibrous covering and paint had those two substances alone for insulators, did it not?

A. Yes.

26 X Q. Was it in consequence of this Brush letter that you began your experiments which culminated in the patent in suit?

A. I cannot say that it was.

27 X Q. Is not that the inference necessarily drawn from your direct testimony?

A. The Brush letter was introduced to show a date after which I began to experiment practically in the manner indicated.

28 X Q. Do you mean by your last answer that you had experimented practically or otherwise in electrical conductors of this character prior to the receipt of the Brush letter?

A. Prior to the receipt of the Brush letter I was aware that the method which we were pursuing in the manufacture of wire covered with fibrous material and paint did not produce a perfect insulation. I cannot say that I had made any experiments prior to that

date, but I believe I directed that as much paint as possible should be put upon the covering.

106 29 X Q. On the 9th day of December, 1880, did you have and were you making use of in factory at Ansonia braiders, for the purpose of applying the fibrous covering or jacket to wire to be used for electrical purposes?

A. We had such braiders and we were making use of them at that time.

30 X Q. Were those braiders single or double-decked braiders?

A. They were single-decked braiders.

31 X Q. Do you understand the principle upon which those braiders worked, so as to be able to tell whether they wound or braided the fibrous covering or jacket upon the wire?

A. They braided the fibrous covering upon the wire.

32 X Q. Do you know who furnished those braiders to your company and when they were furnished?

A. I did not purchase the braiders myself. I believe they were purchased at Providence, at different times and for several years previous to the date of which you have spoken.

33 X Q. Should you recognize the name of the manufacturer who furnished them to your company, do you think, if I should state it?

A. I know that the Rhode Island Braiding Machine Co. is one firm from whom we have purchased braiders. If they are from any other parties I might recognize the name if you will mention it, but I could not make any positive statement, not having purchased them myself.

34 X Q. If your company purchased braiders from any other company than the Rhode Island Braiding Machine Company, its books would show that fact, would they not?

A. I think they would.

35 X Q. Would the books of the company also show the date when your company first purchased a double-decked braider?

A. They would.

36 X Q. Please state the process by which, prior to December 9, 1880, using the single-decked braider, your company insu-

107 lated so much of its wire as it did in fact insulate by the application of a fibrous covering and paint?

A. I cannot positively say that we used any paint in connection with a braided covering at that time.

37 X Q. In what connection did you use paint?

A. We used paint in connection with a double covering of thread wound upon the wire.

38 X Q. Did the company at that date have in its factory at Ansonia double-decked winding machines?

A. It did.

39 X Q. And do you know from whom and when they obtained those double-decked winding machines; and if you do not know would your books disclose?

A. We built them ourselves.

40 X Q. Where did you build them and when?

A. We built them at our machine shops at Ansonia. When I

cannot state, as they were built from time to time. All of the winding machinery which we have in use is of our own construction.

41 X Q. Would the books of your company show when they were constructed?

A. I think we have means of knowing when they were constructed.

Adjourned to Thursday, December 16th, 1886, at 10 o'clock a. m.

G. T. P., *Notary.*

NEW YORK, N. Y., *December* 16, 1886.

Met pursuant to adjournment.

Counsel present as before.

Cross-examination of Mr. A. A. COWLES continued:

42 X Q. Which of the two substances used in insulating your wire, the fibrous covering or the paint, produce the major part of the insulation?

A. Both the fibrous covering and the paint are insulators, or rather imperfect conductors of electricity.

108 Dry cotton is an insulator; paint is also an insulator.

The dry cotton without the paint would cease to be an insulator if it should become surcharged with moisture.

The paint without the cotton would cease to be an insulator if it became cracked or flaked off so as to admit moisture to the surface of the wire.

For practical purposes of insulation in the wire in question I should consider that the paint was the main insulator and that the cotton was mainly instrumental in holding the paint in its place upon the wire, and the paint also, being thoroughly incorporated with the cotton and protecting it from moisture, preserves the insulating properties of the cotton.

43 X Q. Given two pieces of copper wire of the same size, one covered with paint without braid, the other covered with braid but without paint, neither of them being subject to the action of moisture, and the same conditions applying to each alike, which piece of wire would be the better insulated?

A. Either wire under such circumstances would be insulated. It is impossible for me to state without testing two pieces of wire made as suggested in your question which would be the better insulated of the two.

44 X Q. When you say, as I understand you to, in answer to direct question number 20, "the requirements for perfect insulation of wire are such that an uneven coating is a great defect," do you mean that remark to apply, in the wire produced by you, to the coating of fibre, the coating of paint, to both, or the coating as a whole?

A. In my answer I intended the remark to apply particularly to the coating of paint, because with my method of applying a fibrous material there was no danger of an unequal coating of thread.

45 X Q. Is it true, as a matter of fact, it would be an advantage to have the painted coating of a uniform thickness?

A. It is an advantage to have the painted coating thor-
109 oughly and uniformly incorporated with the cotton, which I think is more apt to be the case when the paint is uniformly distributed upon the cotton.

46 X Q. Do I understand you as meaning to say that if paint was applied to a layer of fibrous material by means of a hand brush or passing it through a bath of paint that the paint so laid would not become incorporated with the layer of fibrous material?

A. The effect of applying a layer of fibrous material upon the wire and then applying a coat of paint upon the fibrous material would be that the fibrous material would absorb the oil with which the paint is mixed, and the carbonates or oxides forming the non-combustible portion of the paint would remain upon the outside of the fibrous material.

I have a piece of wire covered in exactly the manner described in your question, and I will produce it, if desired, to show that the paint does not become incorporated with the fibrous material.

47 X Q. Is the paint usually used by the complainant company white lead?

A. At present we are not using much white lead.

48 X Q. Did you at first use white lead?

A. We did to some extent.

49 X Q. Did you ever use any zinc paint?

A. We have.

50 X Q. Do you know which you have used the more of?

A. I do; we have used principally oxide of zinc paint.

Redirect by Mr. MITCHELL:

51 Re-D. Q. In reply to X question 46 you offered to produce a wire to illustrate your answer. You may now produce the same, say what it is, and explain how it illustrates the point as to the non-incorporation of the paint with the fiber.

A. The sample wire which I now produce is manufactured in the following manner:

The bare wire was first covered by winding upon it a double
110 layer of dry cotton thread. The wire thus covered was then immersed in a bath of paint. The oil with which the paint is mixed will be found to have soaked into and filled the covering of cotton, while the oxide or non-combustible portion of the paint remains upon the outside of the cotton and is not incorporated with the fibrous material, which is soaked with oil and is very inflammable.

The wire produced by the witness is placed in evidence and marked Complainant's Exhibit "Cowles Brush Illustration."

52 Re-D. Q. How does the sample of wire produced compare with the wire which you furnished to the Brush Company previous to December, 1880, as testified to by you?

Question objected to, as also the answer to the last question and the exhibit produced, as not being in rebuttal to anything brought out on the cross-examination.

A. The sample produced is prepared exactly in the same manner as was the wire furnished the Brush Electric Company previous to December, 1880.

53 Re-D. Q. Can you say about what time, so far as you know, your company first ordered braiders with two decks?

A. I cannot say when they first ordered such braiders, but I know that a large order for double-decked braiders was given by our factory at Ansonia about the middle of May, 1881.

Recross by Mr. SEYMOUR:

54 Re-X Q. Have you any means of fixing the date when or about when the piece of wire just produced by you and marked Complainant's Exhibit Brush Illustration was manufactured?

A. On or about October 11th, 1885.

55 Re-X Q. Can you fix the date when you first began
111 furnishing wire made like this exhibit to the Brush Electric Light Company of Cleveland, whose letter you introduced in evidence yesterday?

A. I think it was in 1880.

56 Re-X Q. The early or latter part of that year?

A. I can't say positively; I think about the middle of the year.

ALFRED A. COWLES.

Subscribed and sworn to before me this 16th day of December, 1886.

GEO. T. PINCKNEY,
Notary Public, Kings Co.

Cert. filed in N. Y Co.

113 UNITED STATES PATENT OFFICE.

ALFRED A. COWLES, of New York, N. Y.

Insulated Electric Conductor.

Specification forming part of Letters Patent No. 272,660, dated February 20, 1883; application filed November 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, Alfred A. Cowles, of the city and State of New York, have invented an improvement in insulated electric conductors, of which the following is a specification.

Before my invention copper wires had been covered with one or two braidings of cords, and paraffine, tar, asphalt, and various substances had been employed for rendering the covering water proof and furnishing a proper insulation. With conductors of this character several accidents occurred in consequence of the conductor becoming heated and setting fire to the insulation. For this reason

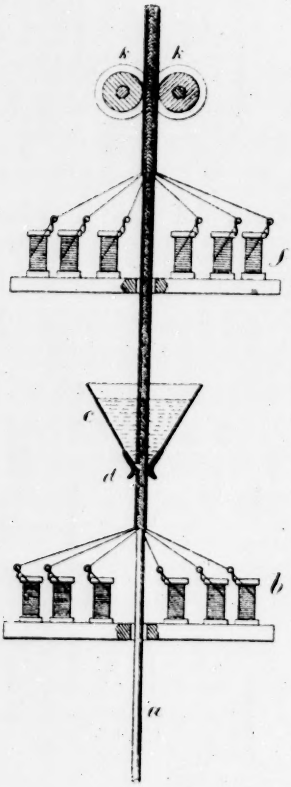
(No Model.) 112

A. A. COWLES.

INSULATED ELECTRIC CONDUCTOR.

No. 272,660. Patented Feb. 20, 1883.

No 165.
A.A.C. Co.
to
Electric
Supply Co.
pp 112



Witnesses
Chas. H. Smith
J. Stahl

Inventor
Alfred A. Cowles
by Lemuel W. Serrell
Atty

objections were made to insuring buildings against loss by fire where electric-lamp wires were introduced. To render the conductor fire-proof without interfering with the insulation led me to invent and manufacture the insulated electric conductors to which the present invention relates, which conductors have gone extensively into use during about a year and a half before the date of this specification.

I manufacture the said fire-proof insulation of the conductor in the following manner, reference being had to the annexed drawing, which illustrates the devices employed.

(Here follows diagram marked p. 112.)

The wire *a* is passed up through the head of a braiding-machine, and a layer of cotton or other threads is placed upon the wire in the ordinary manner. The braiding head, with spools, is indicated at *b*. The covered wire now passes in at the bottom of the vessel *c*, through a suitable packing, *d*. This vessel *c* contains paint, preferably white lead or white zinc ground in oil and mixed with a suitable drier. The paint saturates the braided covering and the surplus runs down the same back into the vessel *c* as the braiding progresses. I next apply a second braiding directly upon the paint. For this purpose a second braiding-machine head is employed, the same being shown at *f*. The threads that are braided upon the paint force the paint into the first braided covering and at the same time the paint oozes through between the threads. Hence the paint is incorporated throughout the braided covering and fills up the pores. The braided covering is rendered even and consolidated by suitable means, such as one or two pairs of grooved rollers, *k k*.

In practical use it is found that the covering is of the most reliable character, it is compact and hard, the wire is perfectly insulated, and there is no possibility of inflaming the covering. With intense heat the threads may char, but they will not burn. For these reasons this insulated conductor is preferred to those before made.

I remark that in the manufacture of this conductor it is preferable to reel the covered wire as it passes from the braiding and painting machine and then remove the reel from the coil and hang up such coil in a heated room until it is thoroughly hardened.

More than two layers of braiding may be employed, the paint intervening between the layers. Winding with threads or cords may take the place of braiding.

If desired, a coat of paint may be applied outside the outer layer of fibrous material, and this may be colored, so as to be used in distinguishing the wires. It is always preferable to braid the second or subsequent coats upon the paint when fresh; but I do not limit myself in this particular, as the paint may be dried, or partially so, before the next layer of braiding is applied. Paint might be applied to the wire before the first braiding.

I am aware that wire has been covered with braided threads; also that india-rubber, asphaltum, and similar materials have been applied upon the covering either hot or cold; but one coating of such material was allowed to set or harden before the next layer of braided

material was applied. Hence the asphaltum or similar material was not forced into the interstices, and besides this all these substances ignite by the wire becoming heated, or fire will follow along upon such covering.

I have discovered that ordinary paint composed of lead or zinc with linseed-oil is practically non-combustible, and it prevents the covering being ignited by the wire becoming hot if there is a resistance to the electric current; besides this, fire will not burn along the conductor, as is the case where the fibrous covering is saturated with asphaltum, india-rubber, or similar material.

I claim as my invention—

1. The method herein specified of insulating electric con-
114 ductors and rendering the coating substantially non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets, substantially as set forth.

2. An insulated and non-combustible covering for electric conductors, composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers and fills the interstices of the covering, substantially as set forth.

Signed by me this 6th day of November, A. D. 1882.

ALFRED A. COWLES.

Witnesses:
GEO. T. PINCKNEY.
WILLIAM G. MOTT.

115 "COMPLAINANT'S EXHIBIT BRUSH LETTER."

The Brush Electric Co.,

Sole manufacturers of

Brush electric light machines, lamps, & carbons.	Cut of factory.	Brush electro-plating machines and apparatus.

Works, Mason St., crossing C. & P. R. R. Office, Belden St.

(Copy.)

Dictated Letter.

CLEVELAND, OHIO, *December 9th*, '80.

Ansonia Brass & Copper Co., New York city.

GENTLEMEN: Please send by fast freight to C. C. Ruthrauff, Salt Lake City, Utah, 10,000 feet of double insulated copper wire, painted heavily on the outside, 165 in diameter.

We would like to have this wire more heavily covered with paint than what you have sent us, as otherwise it does not answer for insulation when the wire is wet.

Send bill for this wire to us and bill of lading to consignee.

Respectfully yours,

THE BRUSH ELECTRIC COMPANY,
By G. W. STOCKLY, *Vice-Pres.*

116 "COMPLAINANT'S EXHIBIT COWLES-EDISON LETTER, MAY 17, 1881."

Ansonia Brass & Copper Co., No. 19 Cliff street.

P. O. box 2375.

NEW YORK, *May* 17, 1881.

Thos. A. Edison, Esq.

DEAR SIR: I intend going to Ansonia to-morrow morning to make arrangements for increasing our facilities for covering wire, and will fit up to make any quantity you may require. I would like to see you this afternoon to ascertain just how much you will be likely to want, and I will call at any hour you will name.

Please send word by bearer.

Yours truly, A. A. COWLES, *Sec.*

I think we shall be able to take 5 ton per week.

EDISON.

117 *Def't's Testimony.*

United States Circuit Court, District of Connecticut. In Equity.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

Proofs for final hearing on the part of the defendants taken before me, Fred C. Earle, a notary public, by consent of parties and pursuant to notice, under and pursuant to the 67th rule in equity, as amended.

NEW HAVEN, CONN., *Jan.* 26, 1886.

Present: Wm B. Wooster, Esq., Chas. E. Mitchell, Esq., Joshua Pusey, Esq., counsel for complainants; Morris W. Seymour, Esq., counsel for defendants.

118 JOHN E. EARLE, a witness produced by and on behalf of defendants, being duly cautioned and sworn, in answer to interrogatories propounded by M. W. SEYMOUR, Esq., of counsel for defendants, testifies as follows:

1st Int. What is your name, age, residence, and occupation?

Ans. John E. Earle; 54; New Haven, Conn.; patent solicitor.

2d Int. Have you had occasion, and, if so, to what extent, to examine inventions and the subject-matter of letters patent and in that connection been called to testify heretofore as a mechanical expert in patent cases?

Ans. I have. For more than thirty years I have been engaged in soliciting patents and up to 1863 in connection with mechanical drawing. Since 1863 my time has been devoted entirely to soliciting patents and investigations and business in connection therewith.

Since January 1, 1862, I have personally prepared more than 6,000 applications for letters patent; have frequently investigated the state of the art in connection with mechanical devices to ascertain whether or not patents granted for certain inventions were valid, in view of the state of the art, also to ascertain whether inventions were patentable. During the last fifteen years I have testified as an expert in a large number of cases in the United States courts. I have also acted as arbitrator in several cases involving the scope and validity of letters patent.

119 3d Int. Will you state whether you have ever had occasion to examine particularly into the state of the art relating to the manufacture of covered wire and the construction and operation of mechanism employed for that purpose?

Ans. I have several times investigated the art of covering wire as applied to electrical and other purposes, the object of the investigation being to ascertain novelty of inventions, scope, and validity of letters patent pertaining thereto.

4th Int. Have you read and do you understand the contents of Complainants' Patent, No. 272,660, granted to Alfred A. Cowles for insulated conductors? And, if so, please state what you find therein described.

Ans. I have, and believe I do.

The alleged invention illustrated and described in the patent referred to relates to an improvement in the manufacture of wire having a coating or covering surrounding it, with special reference to electric conductors, and particularly to that class of such conductors in which two or more fibrous coverings are applied to the wire with intermediate or combined insulated material.

The claims of the patent are, first, for the method or process of insulating the wire; and, second, for the insulated wire itself. The process or method is embodied in three steps—

First. Covering the wire with a fibrous material, as cotton or other thread.

120 Second. Applying a coating of insulating material to the said covered surface.

Third. Applying a second covering upon the said coated surface directly upon the insulating material while that material is green, fresh, or before it sets.

The inventor recognizes the braiding devices by which he applies the coverings as being an old and well-known apparatus, and the inventor states that "winding with threads or cords may take the place of braiding."

Prior to the Cowles patent various devices were employed in applying the fibrous covering or coverings upon the wire for electrical purposes, such as—

Braiding in English patent No. 12991 of 1850, English patent No. 1015 of 1866, English patent No. 694 of 1867.

Winding the threads around the wire, as in English patents No. 185 of 1855, No. 434 of 1859 and others.

Wrapping—that is, folding a ribbon around the wire, as described in English patents No. 906 of 1853, No. 434 of 1859.

Weaving the covering upon the wire by a circular loom, as appears in English patents No. 942 of 1859 and No. 2773 of 1858.

A covering consisting of longitudinal yarns embedded in the insulating material, as in English patent No. 1924 of 1858.

121 A covering composed of longitudinal strands with a braided covering surrounding it, as in English patent No. 2102 of 1858.

A covering composed of thread wound around the wire and a second covering plated thereon, as in English patent No. 2321 of 1858.

A covering composed of two or more layers of cord succeeding layers wound in opposite directions, as in English patent No. 2208 of 1858.

The inventor also recognizes the fact that prior to his invention wire had been covered with braided coverings, and he also recognizes the fact that "India rubber, asphaltum, and similar materials have been applied upon the covering either hot or cold." He states, however, that in such combination of the fibrous coverings and insulating material one coating of the insulating material "was allowed to set or harden before the next layer of braided material was applied," and he states as the result of such applying of the covering or layer of fibrous material upon the hardened insulating material that the insulating "material was not forced into the interstices."

In view of the state of the art as set forth by the inventor, he distinguishes his invention simply by the fact that he applies the second covering of fibrous material directly upon the insulating material, and whereby the application of second covering or layer upon the green insulating material will not only force that green material "into the first braided covering," but will also at the same time cause the paint to ooze through between the threads,

122 thereby incorporating the insulating material throughout the covering and so as to fill the pores.

The first claim of the patent recites as the invention the several steps in the method or process for insulating electric conductors, to wit:

First. Applying a layer of fibrous material upon the wire;

Second. Applying to such first layer of fibrous material a layer of insulating material, and

Third. Applying a second layer of fibrous material upon the insulating material, and before the insulating material dries or sets.

The process which the inventor thus recites as his invention differs only from the process, which he recognizes as existing before his invention, in the one point, that the second layer of fibrous material is applied to the layer of insulating material while this insulating material is still in a green or plastic state.

I take into consideration the fact that the inventor describes "paint" as the insulating material, but this I do not understand to be essential to the process, as the process would be the same were the insulating material of any plastic substance—that is to say, as I understand it, the process must consist of an order or sequence of

steps, and cannot be qualified by the use of a specific material in one of the steps, or the substitution of one material for another; hence I say that I understand the invention recited in the first claim of the Cowles patent to be for the identical process as recognized by the inventor as known in the art prior to his invention, except as to the time when one of the steps in the process is performed—that is, applying the second layer of fibrous material upon the insulating material while that material is green, instead of waiting until the insulating material has dried or set.

I recognize the fact that the inventor states in the specification: "It is always preferable to braid the second or subsequent coats upon the paint when fresh; but I do not limit myself in this particular, as the paint may be dried or partially so before the next layer of braiding is applied;" but I find this statement inconsistent with the process recited in the first claim, that claim specifically reciting that the fibrous material is laid upon the paint "before it sets or dries;" the modification or non limitation suggested in the specification, therefore, cannot apply to the process which the inventor specifically describes in the first claim of his patent.

Regarding the article which the inventor describes as novel, and particularly recites in the second claim, I find it to be for an article covered, rather than the covering for an article, as would be the strict interpretation of the words of the claim, and this article I understand to be a wire inclosed by two or more layers or coverings of fibrous material with paint interposed between the layers or coverings. The inventor in the specification alleges that he has "discovered that ordinary paint composed of lead or zinc with linseed oil is practically non-combustible," and, further, that "fire will not burn along the conductor, as is the case where the fibrous covering is saturated with asphaltum, India rubber, or similar material." The inventor recognizes that asphaltum, India rubber, and other materials were known as insulators before his invention. The invention, then, which the inventor describes and claims as his own, as I understand it, is the substitution of paint as an insulating material in the place of other known materials, and that the article claimed in the said second claim differs only from previous articles in the fact that the insulating material is paint used instead of other known materials.

The claim recites as a fact or qualification of the paint that it "fills the interstices of the covering," but inasmuch as he describes the filling of the interstices to be produced in the process by applying the second layer of fibrous material upon the paint before it sets, and then later in the specification states that he does "not limit myself in this particular, as the paint may be dried or partially so, before the next layer of braiding is applied," I understand the second claim for the article not to be limited to the particular process described for its manufacture, but, on the contrary, to be for the wire having two layers of fibrous material with an intervening coat of paint.

The last paragraph quoted, as it cannot apply to the process, must, as I understand it, qualify only the article. If, how-

ever, this last-quoted statement of the inventor is not to be considered and the claim is to be understood as limited to a construction which necessarily implies the application of the second layer of the fibrous material upon the paint while green, then the claim must be understood to be for the result of the process described and recited in the first claim—that is to say, for a wire covered by a *a* process recognized by the inventor as old, but substituting in that process one insulating material for another.

Defendants' counsel offers in evidence file-wrapper and contents of Cowles patent, which is received and marked "Defendants' Exhibit File-Wrapper and Contents Cowles Patent, F. C. E., N. P."

5th Int. Have you examined file-wrapper and contents of the Cowles patent; and, if so, do you or not find in it any confirmation of or reasons for the conclusions you have expressed regarding the invention described and claimed in the Cowles patent?

Ans. I have examined that record, and find it *to* fully confirms my conclusions regarding the invention recited in the first claim of the patent, for in that record I find the specification to be substantially the same as the specification of the patent, except that the paragraph disclosing the inventor's knowledge of the state of
126 the art in the second column of the first page of the specification, beginning "I am aware," etc., is not found in the original specification, but was introduced after he had been referred to a prior patent; and I also find that the inventor originally made the following as the first claim in his application:

"The method herein specified of insulating electric conductors and rendering them substantially fire-proof, consisting in two or more layers of fibrous material with interposed paint, substantially as set forth."

This claim was erased, the present first claim being the original second in the application.

Inasmuch, then, as the original first claim, considered in connection with the present first claim and with the sentence in the specification in which the inventor says, regarding the condition of the insulating material at the time the second layer of fibrous material is applied, "I do not limit myself in this particular, as the paint may be dried or partially so before the next layer of braiding is applied," clearly indicates that the inventor originally intended to claim the process recited in the second claim, without qualification as to the condition of the paint when the second coating is applied, I am therefore justified in understanding that the plastic or unset condition of the insulating material is a necessary condition in the process of the present first claim.

Regarding the article intended to be covered by the second claim, the record, as disclosed by the file-wrapper and contents, does not warrant the broad understanding of the second claim which
127 I have given to it in my last answer, for I find that the record shows that the inventor made the following as his third and last claim:

"An insulated and non-combustible electric conductor composed of two or more layers of cotton or similar threads with intervening paint substantially as set forth."

Inasmuch as the inventor, by the sentence referring to the non-limitation of himself, provided for the interposition of paint between the two layers of the fibrous covering irrespective of the condition of the paint, I understand the original third and last claim to be for the wire having two or more fibrous coverings with intervening paint, irrespective of the condition of the paint.

This original third and last claim was erased by the inventor, and the present second and last claim inserted, which is the same as the original third, qualified by the condition that the paint "fills the interstices of the covering."

This qualification thus formally introduced by the inventor forbids the broad understanding of the claim which I first gave to it.

No method or device is described in the patent, nor can I conceive of any method or device whereby the paint or insulating material, whatever it may be, can fill the interstices of the covering unless the insulating material be in a soft, green, plastic, undried, or unset condition when the covering is applied.

128 The sentence, therefore, in the specification referring to the non-limitation of the condition of the paint or insulating material is entirely inconsistent with the invention described in the specification and recited in both of the claims.

The requirement that the insulating material shall be in an unset or undried condition when the outer coating is applied warrants only the conclusion that the second claim of the patent is for the result of the process described and recited in the first claim of the patent, and which result can only be attained by the employment of that process, and such is my understanding of the second claim.

6th Int. What prior instances in the art of covering wire do you know wherein are shown or described a covering composed of a layer of fibrous material, a coating of insulating material, and a superimposed layer of fibrous material, said intermediate layer of insulating material being in a green, plastic, or unset state when the second layer of fibrous material is applied?

Ans. I first refer to English patent of Brown and Williams, No. 12991, of 1850.

This patent describes covering wire for telegraphic purposes with strands of yarn employing a braiding or plaiting machine for so doing. In combination with such a braiding machine is a bath or vat arranged below the machine and concentric with it. The bath is provided with insulating material, which is maintained in a soft or plastic condition. The wire to be covered passes down through the machine and through the insulating material; thence
128½ out through the bottom of the vat. The threads or yarns are laid upon the wire within the bath.

Regarding this laying of the yarns upon the wire, the specification says, on page 10, folio 5:

"In covering a single wire we prefer to combine gutta-percha with the strands, and for this purpose we make use of the trough *v* (bath

or vat), which is formed with a jacket for the purpose of receiving steam through the pipe b^1, by which the gutta-percha will be kept in a soft state so as readily to combine with the wire and the strands to form a coating thereto."

Then the inventors state, at folio 20, same page:

"Having covered in this manner the combined strands and wires, we again past them through a similar machine and obtain another covering of yarn, but in this case we make use of vegetable pitch in place of gutta-percha as the coating material; and we prefer in like manner to cover the wires a fourth time with coir (a material made from the fibre of a cocoanut covering), saturating it at the same time with mineral pitch."

In this patent, then, I find a method for covering wire for electrical purposes, which consists in several coatings of fibrous material, having combined therewith insulating material applied during the process of covering and while the insulating material is in a soft or unset condition.

I next refer to English patent of John Wallace Duncan, No. 906, dated April 14th, 1853.

In this patent I find an apparatus for covering and insulating electric conductors, which consists of a reel upon which the wire to be covered is placed, a hopper through which the wire passes; this hopper is charged with insulating material, so that the
129 wire passing through it will receive a coating or layer of insulating material. Adjacent to this hopper is a second reel, carrying a ribbon of covering material, which is led to the wire and with it passes into a funnel-shaped orifice, so that the ribbon is wrapped about the wire and onto the freshly coated surface. This funnel opens into a second hopper, which is charged with insulating or coating material where the first wrapping is compressed upon the first coating and wire, and in its turn receives a coating from the contents of the hopper. Then the covered and coated wire passing on runs through a second funnel, where it receives a second wrapping or covering upon the previously coated surface, and thence through a third hopper, where another coating is applied as before; thence the covered wire passes to four grooved rollers, arranged to embrace the surface of the covered and coated wire, and they being driven draw the wire from the reel through the hoppers, the wires so drawn receiving the covering so applied.

The patent describes the strips or ribbons to be applied as sheet metal, textile, or other suitable fabric of proper width.

In this patent I find exhibited and described an apparatus for coating and covering wire with at least two ribbons of textile fabric wrapped about the wire, with an intermediate coating of plastic or insulating material, the second layer of textile covering being applied to the adhesive or insulating material while that material is in a plastic, undried, or unset condition—that is to say, the
130 method or process described in this patent consists in applying a layer of fibrous material, a layer of adhesive or insulating material, and a second layer of fibrous material before the intervening layer dries or sets.

I next refer, as exhibiting the method called for by the question, to English patent No. 933 of 1857, granted to Felix Marie Baudouin. This patent is for improvements in electric wires or conductors.

In the apparatus exhibited in Figs. 1 and 2 of this patent a reel is supported at one end of the apparatus, upon which the wire to be treated is to be wound.

At the opposite end of the machine is a similar reel to receive the wire after it shall have been treated. The second reel has power applied to it to impart rotation thereto on its own axis to draw the wire from the first reel. The axis of the two reels are parallel to each other and at right angles to the line of wire passing from one reel to the other.

The reels are each hung in a frame which revolves upon an axis parallel and concentric with the axis of the wire, and so that revolution is imparted to the line of wire between the two reels.

Between the two reels and below the wire is a trough containing the insulating material to be employed, and this is maintained in a semi-fluid condition.

Above the wire are several spools or reels, each containing a narrow ribbon of the material to be wound upon the wire, three such ribbons being illustrated.

131 At the first end of the trough a grooved wheel is arranged over which the wire passes, and this wheel, dipping into the insulating material, deposits upon the revolving wire a layer of the material.

The ribbons are successively led down into the insulating material in the trough; thence returned and applied to the wire, and so that the wire, revolving, will draw the ribbons from the reels through the insulating material and then successively wind the ribbons, thus charged with insulating material, upon the wire, the second ribbon wound upon the first and the third upon the second. After the wire has passed beyond the last winding it is compressed to cause the proper adhesion of the ribbons wound thereon.

The specification thus briefly describes the invention before proceeding to the full and more particular description, page 2, folio 5:

"The machinery is of two kinds, one of which conducts the operation of lapping the ribbons or strips of paper or other suitable material round the coated wire, the wire having a motion of transmission in the direction of its length, and also a rotary motion for winding on the ribbons.

"The wire is wound on a reel or drum whose axis is placed in a frame mounted on an axis. The wire is conducted over suitable guide pulleys through the spindle and in a line with the axis of the rotating frame, and thence to a drum in another similar rotating frame placed at a distance from the first. The latter drum has a motion to wind on the wire, while the first wire drum has a break to create sufficient tension on the wire in its being drawn off. Thus a motion of rotation and transmission are simultaneously im-

132 parted to the wire. The ribbons or reels containing the ribbons or strips of material to be wound on the wire are placed between the two rotating frames, with their axis placed at such an

angle or incline to the wire that as the wire rotates and traverses lengthwise it winds upon it a helical coil from each bobbin whose edges are closely united, the position of the bobbin being regulated to insure their close contact. I prefer to use three ribbons and bobbins for this purpose, the first covering of the wire being enveloped by the second in such manner that the helical junction of the first ribbon is covered by the second, and the second by the third. The wire is passed through a bath of hot bitumen and has the superfluous matter removed by passing through suitable dies or parts to scrape and smooth its surface and render it of uniform thickness. The first and second ribbons are also passed through bituminous or other suitable matter to render them more impervious to electricity. The coated and lapped wire is passed through suitable dies to remove superfluous matter, to smooth down the lapping of the ribbons, and to compress and cause their proper adhesion."

Adjourned to Wednesday, January 27th, 10 a. m.

JAN. 27, 1886.

Met pursuant to adjournment.
Counsel present as before.

Witness, continuing his answer to Int. 6, says:

The quotation which I have made is from the provisional specification. In his final specification, and preparatory to a complete description of his invention in connection with his drawings,
133 the inventor says, on page 5, beginning at folio 15: "My invention relates to a particular method of preparing the wires conducting the electricity for electric telegraphs for the purpose of insulating them, and thereby avoid loss and alteration of electric currents; and it also relates to the mechanism by the aid of which such preparation and manufacture of these conductors is effected.

"The elastic and impermeable substances ordinarily employed for covering the wire conductors of electricity for the purpose of insulating them generally present this serious inconvenience. On account of their elasticity they get out of form and are easily impressed under greater or less pressure to which they may be submitted, particularly when they are at the same time subject to a sufficiently elevated temperature to soften them. Thus, under the influence of heat, copper wires covered with gutta-percha simply by the effect of the alterations of the metal in expanding or contracting make holes through such coverings and come in contact with the metal coverings intended to protect them on the exterior, and thus destroy their insulation. To remedy this great inconvenience I insulate telegraph wires by alternate coatings of insulating matters and covering bands or *or* tapes of textile fabrics which are themselves prepared with insulating matters, each layer being compressed and the continuity of the same preserved throughout, the whole producing a body of such consistency and power of resistance to the alteration of form that the insulating materials do not of themselves possess."

Again, after describing his apparatus, the inventor says on page 10, beginning at folio 35:

"By means of these arrangements I can cover the wire at one operation with as many coatings and insulating coverings as I wish, for which purpose it is sufficient to vary the number of pullies which apply the bitumen and of the bobbins carrying the supply of
131 tapes or bands and of the guides, smoothers, etc. I can also vary at will the nature of the coverings, and also that of the coatings, by having several different baths of coating material. I can also in certain cases use tapes, strips, or bands of impermeable tissue and paper, etc., instead of the tapes or bands of cloth."

The inventor, in defining combinations which may be made in the employment of his method and apparatus, says on page 11, beginning at folio 5:

"Among other combinations the following is a very efficient and cheap covering:

"First, a coating of bitumen on the surface of the wire.

"Secondly, a covering of cotton, ribbon, or tape which has been dipped into the bitumen.

"Thirdly, the application over this first ribbon covering the bitumen of a tape or narrow band of gummed taffetas or fine cotton prepared in the same way as gummed taffetas.

"Fourthly, a second covering of tape or ribbon permeated with bitumen.

"Fifthly, a last covering of dry tape or ribbon, intended to absorb the excess of bitumen and to obviate the viscosity it would present if it remained uncovered.

"I can substitute for this last covering of dry ribbon a covering composed of strong threads of hemp or linen."

Again, as to the use of his apparatus, the inventor says on page 11, folio 25:

"The same apparatus serves to obtain analagous results with other insulating preparations, such as preparation of India rubber, resin, gum lac, fatty oils, etc."

Again, in defining the result of his invention, on page 12, folio 25, says:

135 "According to my method of covering telegraph wires the inner coating of gutta-percha may be very thin, at the same time rendering it as continuous as possible, and by applying one or several alternate coverings of bitumen and impermeable tapes or bands I not only completly obliterate the interstices or other defects which the gutta-percha may present, but also make it less easily put out of shape, as these coverings of textile fabric hold it and do not allow it to be so easily displaced."

The inventor also states that his apparatus may also be placed in a vertical instead of a horizontal position, the illustration being horizontal. Finally, to sum up, the inventor states as his claimed invention as follows, page 14, folio 25:

"First, the insulation of the wires or conductors of electricity by the application of insulating coatings or coverings, consisting of tapes or ribbons of tissue, of textile or thread material themselves, either previously impregnated or not with insulating matters ap-

plied alternately with layers of insulating matters, as hereinbefore described."

In this patent I find described and illustrated a method of insulating electric conductors, consisting in applying a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material upon the insulating material before it dries or sets, substantially as set forth in the Cowles patent in suit.

I should remark that this English patent No. 933 of 1857, like most of the methods of covering and insulating wire, applies a coating of insulating material directly to the wire, and that the
136 Cowles patent in suit specially provides for the same application of the insulating material directly to the wire before the first fibrous layer is applied.

The apparatus described in this English patent No. 933 of 1857 fully and completely employs the same method or process identically as that described in the Cowles patent in suit, and the claim which I have quoted as fully defines and recites the alleged invention of Cowles as does the first claim of the Cowles patent, the only difference being that in the Cowles patent "paint" is employed as the insulating material instead of other known materials, but the specification of the said English patent particularly includes all or any insulating materials.

Inasmuch, then, that as by the method and apparatus described in the said English patent as in that described in the Cowles patent but one result or product can be obtained, to wit, an insulated covering for electric conductors composed of two or more layers of cotton or similar threads or fibrous material with insulating material that intervenes between the layers and necessarily fills the interstices of the covering, I find in the said English patent the same invention as alleged in the said Cowles patent, and particularly recited in the second claim thereof.

I next refer to English patent of Wm. H. Horstmann, No. 434, dated Feb. 15th, 1859.

In this patent I find an invention described for the manufacture of telegraphic conductors. The method described consists in
137 applying successive wrappings to the wire, together with intervening layers of insulating material, and then winding threads or cords upon the surface, each successive wrapping being applied to the freshly coated surface. The inventor, in stating the nature of his invention, says, on page 4, folio 20:

"My invention consists, first, in the mode of coating and combining the conducting wires so as to render the insulation perfect, and also diminishing the danger of fracturing the conducting wires. To effect this object I cover the conducting wire after it has passed through a process of brightening on its surface with a coating of gum lac, which may be repeated if found necessary, and then I coat the wire outside the covering of gum lac with cloth or other fibrous material. I then submit the wire thus coated to a process of coating with some sufficiently pitchy compound or resinous compound, preferring for this purpose a mixture of rosin and tar or asphaltum

and turpentine, to make a sufficiently elastic compound. After this an additional covering of fibrous material should be put on."

In describing his invention the inventor says, beginning at folio 35, page 4:

"My second improvement is in the new mode of constructing the cable while being laid. To effect this I take a wire of copper or other good conductor of electricity wound on spools, reeled, or otherwise coiled in a way that will admit of being readily removed. This is shown in the drawing at *a a*. From thence I pass the wire through a series of sand paper or other proper scourers and leather polishers at *b*, by which the oxidized surface is removed, and the bright metallic wire thus cleansed is passed along the junction of two inclined planes at *c*, down which the dissolved gum lac is caused to flow, and thus coat the wire perfectly. After passing the coating
138 apparatus the wire is drawn through the center of a heated cylinder or oven, c^1, when it is equalized somewhat, and then passes between two rollers at c^2, where it receives a covering of cloth or other proper fibrous material, the rollers being grooved to receive the coated wire, wrap the fibrous material closely around the wire, when it adheres to the gum-lac coating. (The rough edges of this fibrous covering are laid down with the next coating of pitch, rosin, or other material applied as hereafter described.) I convey the wire through the apparatus at *c* containing gum lac dissolved in a pure state or mixed with turpentine or other resinous material that will serve to make it more elastic. The construction which I propose as the best for the reservoirs for the gum-lac, pitch, or rosin composition, hereafter described, is as follows: I have a reservoir or kettle (see Fig. 2) which, if it is to be heated, is made double and is heated by steam.

"This reservoir is hung on trunnions or lugs, so as not to be canted by the rolling of the vessel. At the axis of this reservoir the wire above named is made to pass through a casing surmounted by a double-inclined table or a hopper, which feeds the coating material to the wire as it is drawn through and is itself supplied from the reservoir. The wire then runs through an apparatus at *d*, filled with rosin mixed with sufficient tar to make it pliable, or with a similar compound of the resinous gums. This is preceded by a coating of muslin, tape, paper, or other fibrous material, or gutta-percha or India rubber, and it is then passed through a wrapping-guide apparatus like the former, or as seen at *e*, which wraps this material around the wire; the operation being completed by a spring fork, *f*, above, a second coating of the resinous compound and another tape may then be added, or more if found advisable."

In this patent I find a method for insulating electric con-
139 ductors consisting of a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material upon the insulating material before it dries or sets, substantially the same as the method described in the Cowles patent in suit, and particularly recited in the first claim thereof; and inasmuch as such method can produce substantially but one result and that result being an insulated covering for electric conductors composed of two

or more layers of fibrous material with an intervening insulating material which necessarily fills the interstices of the covering, I find described in the said English patent the alleged invention recited in the second claim of the Cowles patent.

I find another instance of the method called for in the question in English patent granted to Charles William Siemens dated Feb. 20, 1863, No. 464, the invention of the said patent relating to "improvement in insulating and supporting telegraph line wires."

The insulating material specially described in this patent is "the juice or milk extracted from the India-rubber or gutta-percha trees, or varieties of the same."

In one of the methods of insulating described in the patent the core is covered with a fibrous material, thence run through a bath of the juice, then a second layer of fibrous material applied before the juice or insulating material has become dry. This method is clearly described on the 6th page of the specification, beginning at folio 15, as follows:

"I have also applied with advantage the above-described
140 means of coating with India-rubber or gutta-percha juice in the manufacture of hempen or other cables for submarine telegraph lines. For this purpose I pass the core after it has been spun once round with hemp or other fibrous material in one direction through a bath of India-rubber or gutta-percha juice, and I then spin the second layer of hemp or other fibrous material in the reverse direction before the juice has become consolidated and dry, or I let a stream of the juice pass upon the wire when once covered and before the second covering is applied. The saturated fibrous covering of great tenacity so formed may then, before the juice has had time to dry, with advantage be covered with a metallic laminous sheathing, as described in the specification to certain letters patent granted to me and bearing date the 9th of January, 1862 (No. 59), after which the cable so formed must be exposed for some time to the atmospheric influence, in order that the India-rubber or gutta-percha juice may become perfectly consolidated or indurated."

And in summing up specifically his points of invention he states as his third claim as follows, page 9, folio 10:

"Effecting a tenacious covering to insulated telegraph line wire by saturating the fibrous material employed in forming the same with the juice or milk of the India-rubber or gutta-percha trees, in the manner hereinbefore described."

In this English patent I find described and claimed a method of insulating electric conductors, consisting in applying a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material upon the insulating material before it dries or sets, the said method being substantially the same as the method or process described in the Cowles patent in suit, and particularly recited in the first claim thereof, and because the result
141 of the method can be but one thing, to wit, an insulated covering for electric conductors composed of two or more layers of fibrous material, with an insulating material that intervenes between the layers and necessarily fills the interstices of the

covering. I find described in the English patent substantially the same invention as that described in the said Cowles patent and particularly recited in the second claim thereof, understanding that the specified paint as the insulating material in the Cowles patent is but the substitution of an equivalent insulating material known as such, prior to the Cowles patent, for the specific juice described in the said English patent as the insulating material.

I next refer to English patent granted to William Thomas Henley May 4, 1864, No. 1126, the patent being granted for improvements in telegraph wires and cables and in apparatus used in their manufacture.

This patent describes and shows an apparatus for applying two or more layers of yarn wound upon the wire with an interposed coating of insulating material applied in one of the steps in covering the wire and between the application of successive layers of the fibrous material or yarn.

This machine consists of several winding devices through which the wire to be covered is led. The winding devices consist of spools carrying the thread or yarn arranged on revolving heads through the axis of the heads the wire is led, and so that as the heads
142 revolve around the wire, the wire at the same time having a longitudinal movement, the threads are drawn from the spools of one head and wound around the wire. The second winding device is the same as the first except that the winding is in the opposite direction, and so that the second layer of thread will be wound upon the wire in a direction opposite that of the first layer.

Between the two winding devices a bath is arranged containing the insulating material, and through which the wire is led immediately after receiving the first layer of thread and just before it enters the second winding device, and so that the second layer of fibrous material or thread is laid upon the insulating material before it dries or sets.

In his description the inventor says tape may be employed instead of yarn, and in describing his apparatus he says, beginning in folio 30, page 5, as follows:

"The wire is coiled on the bobbin B and is taken from thence through the composition under the sheaves *a a*, and then passes up to the first covering disk *b*. (This should be placed in an upper floor some distance above the steam-chest.) The wire here receives a coating of dry cotton or other suitable fibrous material from the bobbins; it then passes over the sheave *c*, descends to the steam-chest, and receives another application of the composition; it then passes under another pair of sheaves, and on leaving the steam-chest it passes through a conical die which presses the hot compound into the cotton and at the same time takes off all the superfluous material; the wire then ascends to the second covering disc and receives another covering of yarn in the opposite direction to the former, and again passes over a sheave and descends to the steam-
143 chest and gets another covering of the compound, after which it may be taken away over the sheaves at the top and through the grooved rollers *e* and *f*, figure 2, to the taking-off drum, or the

covering with yarn and composition may be repeated as many times as may be thought necessary according to the amount of insulation required. The axle carrying the upper sheaves is driven by the screw and worm wheels in the same manner as the taking-off drum, so that there may not be too much strain on the wire or covering by being pulled over the number of sheaves. Instead of yarn the wire may be covered with tape or the last covering may be of tape.

* * * * * * *

"Figure 3 shows another arrangement of machinery for accomplishing the same purpose as that shown in figures 1 and 2, A A being the steam-chests and B B the covering discs. Of course, these may be multiplied to any extent according to the number of coatings required. I do not confine myself to any of the exact plans herein described so long as the arrangement is carried out of applying all the coatings of composition and fibrous materials at one and the same time."

Adjourned to Thursday, January 28th, 10 a. m.

THURSDAY, *January 28th*, 1886.

Met pursuant to adjournment.
Present: Counsel as before.

Witness, continuing his answer to 6th Int., says:

After having described his invention and evidently to more
144 particularly distinguish it from previous methods of insulating telegraph wire the inventor states, at folio 15, page 6, as follows:

"I am aware that attempts have been made before to insulate telegraph wires by alternately covering with cotton or silk and resinous matters, but owing to each covering having been made a separate operation the work was so imperfectly done that the covering was useless as an insulator."

Finally, in particularly specifying what he claims as of his invention, the inventor states in the second clause of claim that he claims "the insulating of the conducting wires with one or several coatings of compositions and fibrous materials at one and the same time, as hereinbefore described and illustrated at figures 1, 2, and 3, sheet 1, of the accompanying drawings."

It will be observed that there are two sets of drawings, the one belonging to the provisional specification and the second to the complete specification. It is to the second drawings which he refers in the description which I have quoted and in his claim.

In this said English patent No. 1126, of 1864, I find an apparatus substantially identical with that described in the Cowles patent—that is, understanding the Cowles patent, when it states that "winding with threads or cords may take the place of braiding," describes and includes any then known winding apparatus, arranged in at least two sets, with an intermediate bath through which the wire with its first covering is led immediately before it reaches the second set of winding devices.

145 With the apparatus of the Cowles patent and with the apparatus of the English patent No. 1126, of 1864, with the same thread or cord and with the same insulating material, but one and the same result and article could be produced.

I find in the said English patent identically the same process and method of insulating electric conductors as that described in the Cowles patent and made the subject of the first claim thereof. And for the reason that but one result or product can come from the use of the said method or process, and that result an insulated covering for electric conductors composed of two or more layers of cotton or similar threads with an insulating material that intervenes between the layers and fills the interstices of the covering, I find in the said English patent the alleged invention described in the Cowles patent and particularly recited in the second claim thereof.

As I have before stated, I consider the substitution of the one kind of insulating material, "paint," mentioned in the Cowles patent, instead of a composition mentioned in the said English patent, but to which composition the inventor particularly states that he does not confine himself, not to qualify or limit the claims of the Cowles patent.

I next take up English letters patent granted to Jaloureau and Lardy, No. 2942, dated October 19, 1867, for improvements in the construction of telegraphic cables, &c.

146 In this patent I find fully described and illustrated an apparatus arranged to wind successive layers of thread or cord upon a wire, the layers of cord or thread having a coating or layer of insulating material applied to their surface, the first layer of insulating material being applied to one layer of cord before the next layer of cord is applied, and so on, each succeeding layer of cord being applied before the insulating material has hardened or set.

The apparatus shown and described consists of a reel arranged at one end and carrying the wire to be coated, with a device at the opposite end serving to draw the wire from the reel at the first opposite end through the machine and through the intermediate winding and coating apparatus.

The winding apparatus consists of several heads arranged in succession between the reel at one end and the discharging mechanism at the opposite end, the said heads revolving upon an axis concentric with the line of wire passing through the machine.

These heads each carry two spools diametrically opposite each other, and the spools provided with the covering cord or fibrous material, and so that the cord running from the spools and applied to the wire is wound thereon by the revolution of the spool-carrying heads, each succeeding head applying an additional layer of thread or cord.

In the apparatus five such winding heads are provided, thus applying five layers of the fibrous material to the wire.

147 Immediately succeeding each winding head a bath containing insulating material is arranged below the line of wire, and over each of these baths a cylinder is arranged to revolve, its axis parallel to the line of wire, and in such relation to

the bath and wire that its surface dips into the insulating material in the bath, and so as to take up on its surface a coating of the insulating material and deposit the same upon the surface of the passing wire, and so that as each successive layer of fibrous material is applied to the wire it next receives a layer or coating of insulating material before the next layer of fibrous material is applied, the said next layer of material being applied while the insulating material is in a green, undried, or unset condition.

In the description a part of the spools are provided with paper instead of thread, and the threads as well as the paper are described as being previously prepared with bitumen—that is, as the patent states, the fibrous material is "bitumenized," and the insulating material employed in the bath is also bitumen, and as a final treatment to the wire after the last coating with bitumen from the bath a coat of sand is applied, this sanded surface being finally rolled or compressed to force the sand into the last coating of insulating material and to give to it an even and circular form.

In their specification, and preparatory to a particular description of their process and apparatus, the inventors state the nature of their invention as follows, folio 10, page 4:

148 "Our improved cables are constructed in the following manner: The copper conducting wire is first covered with bituminously prepared thread or twine; the cable thus formed is then subjected to a hot bituminous bath, by which a layer or deposit of bitumen is obtained; this is covered with bituminously prepared paper wound spirally round the cable; it is then again subjected to the bath, and a second layer of bitumen deposited thereon, after which it is again covered with paper as before, and then coated with bitumen by means of the bath, then another layer of paper, then a layer of bitumen, then a layer of paper, then a layer of thread as before, and finally a casing of bitumen, which is sanded all over, and in cases where desired to make a more powerful cable it may be strengthened by iron bands wound in a spiral form round it; this is done previously to the final coating and sanding. The cables thus manufactured are flexible and solid, whilst at the same time the wires being perfectly insulated have all the necessary conducting properties, and from the simplicity of the manufacture and the materials employed therein, have considerable advantages over those in present use."

In this English patent No. 2942 of 1867 I find described and illustrated substantially the same method or process as that described and illustrated in the Cowles patent in suit, and particularly recited in the first claim thereof, and for the same reasons given in comparing previous English patents with the Cowles patent I find the result of the process or method described in the said English patent 2942 of 1867 to be the same result as that described in the Cowles patent and particularly recited in the claim. In both the said English patent No. 2942 and the said Cowles patent there is the

149 same application of a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material applied before the insulating material dries or sets, and because of

the so applying of the second layer of fibrous material the interstices of the covering are necessarily filled. Hence I find in this English patent the same process and the same result as described and claimed in the Cowles patent.

Next, letters patent of the United States granted to Alfred Fauvin Jalourcau, of Paris, France, dated June 23, 1868, No. 79126, for "improvement in machines for manufacturing telegraphic cables." The invention illustrated and described in this patent is evidently the same as that illustrated and described in said English patent 2942 of 1867, which I have last referred to, and the same description and statement which I have made regarding the said English patent apply equally to the said United States patent.

I next refer to English patent No. 3314 of 1870, dated Dec. 19, by Joseph Rogers, for "improvement in insulating telegraph wire and in the machinery or apparatus to be employed therein." In this specfication I find described a process and apparatus in which successive layers of yarn or threads of fibrous material are applied to the wire, the successive layers of fibrous material and wire drawn through a bath of insulating material, whereby the wire and fibres become coated with the insulating material, and each successive layer of fibrous material applied in a continuous operation and before the preceding coating of insulating material shall have hardened.

In setting forth the nature of the process and apparatus the inventor says, beginning on page 1, folio 10, as follows: "In order to insulate a single-wire conductor or a strand of wires I coil such wire or strand around a drum or reel set in standards and controlled by a friction break, and I arrange in suitable bearings a series of bobbins containing yarns or threads of fibrous material in such manner as to surround the wire or strand as it is drawn from the reel or drum, each bobbin being checked by a friction break. The wire or strand is then drawn together (with) the fibrous materials through a trough constructed in sections or divisions, the first of which contains heated air, the second forming a cauldron of insulating material or compound, and the others being constructed to repeat the process as may be required. Now, the passage of the wire and fibres through the hot-air chamber serves effectually to remove all moisture from the surface of the wire and to heat the metal. It also desicates the fibre, thus rendering both more capable of taking up the insulating compound and entirely avoiding the generation of air cells between the conductor and the insulator. In the division between the air chamber and cauldron, which division consists of a sliding plate set in channels or grooves, I form a central aperture for the passage of the wire and a series of concentric apertures for the fibres to pass into the cauldron, within which I set one or more perforated discs which revolve within a frame and through which the fibres pass. Consequently, the wires and fibres first become separately charged or coated with insulating material and then the fibres so coated are twisted or coiled around the wire, after which the whole is passed through a trumpet-mouthed tube

in order to compress the mass, still allowing free and suffi-
151 cient space between the wire and fibre to insure the wire being completely insulated.

"To further insulate the conductor I employ a second series of bobbins and fibres and draw the insulated wire from the cauldron within their range and through a disc and second trumpet tube of increased dimensions, all being subjected to the influence of insulating material in the trough, and this process may be repeated as often as desired, according to the purpose of the conductor whether for deep sea or land purposes. The trough may therefore be of any length required and subdivided accordingly into chambers by means of adjustable slides. The trough is encased by a jacket, into and through which steam is admitted in order to heat the air chamber and to maintain the solvent condition of the insulating materials, which may consist of gutta-percha, India rubber, or any of their compounds, or of any other insulating medium to which I lay no claim, but I prefer to use the compound patented by me under date April 23d, 1868, No. 1336. The conductor is ultimately drawn out through a die, and dusted over with chalk, silicate, or other earthy dust for the purpose of avoiding stickiness or tack, and it may be passed through a water chamber for the same object, and finally wound on a drum for use."

And in specifically defining this process the inventor says on page 3, folio 5, as follows:

"It will thus be observed that the process is continuous, whatever may be the ultimate dimension of the cable. For land purposes a single insulation may be sufficient and the conductor may be at once withdrawn, but for deep-sea cables the process may be repeated by successive operations in one and the same trough."

I find in this patent as clear a description of a method of insulat-
ing conductors, consisting in applying a layer of fibrous ma-
152 terial, a layer of insulating material, and a second layer of fibrous material upon the insulating material before it dries or sets, as is disclosed by the Cowles patent; and the process or method of the one is substantially identical with the process or method of the other.

And, for the reasons before given, the same result or product must necessarily follow from the process of the said English patent No. 3314 of 1870 as will follow from the process of the Cowles patent in suit. I therefore find in the said English patent the alleged invention recited in the two claims of the said Cowles patent.

I come now to English patent No. 1333 of 1880, dated March 31, and granted to George Frederick James for "improvements in or applicable to machinery or apparatus for the manufacture of engine packing, insulated telegraph wires, and other similar manufactures."

The apparatus described and shown in the said English patent consists of a funnel-shaped hopper arranged in a vertical position adapted to receive an insulating material and with an opening through its apex or bottom for the passage of the wire to be insulated. Immediately below the hopper is a winding apparatus carrying a single thread and what is called a flyer arranged around

the wire and so that the thread led to the wire through the said flyer will be lapped or wound thereon.

The core or wire has a series of yarns applied to its surface and surrounding it as it passes through the hopper; the layer of
153 threads on the wire thus passing through the hopper receives a layer of threads by the winding apparatus before described.

The hopper being supplied with insulating material the core and first layer of threads receive a coating of the insulating material, and the second layer is wound around the first directly upon the fresh, green, or unset insulating material.

The patent describes and the drawing shows a braiding machine immediately beneath the winding apparatus and through which the covered wire passes, and there receives a third layer of thread upon the second.

The patent does not show or describe the reel or spool devices above, which carry and deliver the wire and the threads of the first layer.

The principal feature of the invention appears to be a peculiar construction of the hopper whereby the material is kept in proper condition for application to the core and yarns passing through it.

The patent describes the invention as applicable to several purposes, one of which is that of insulating wires, and it is only to that class of the products that I have particularly referred.

The apparatus shown and described is a vertical one---that is to say, the wire is moved through the hopper and covering apparatus in a vertical direction, and is therefore of the same character as that of the Cowles patent in suit.

The hopper in the English patent, aside from the peculiar
154 construction to which I have referred, is substantially like that shown in the Cowles patent. One layer of the fibrous covering is applied to the wire before it passes through the hopper, and the second layer of material is applied immediately after the covered wire passes from the hopper, substantially as in the Cowles patent, with this non-essential difference, that in the English patent the movement of the wire is downward and in the Cowles patent it is upward. In the English patent the first layer of fibrous material is applied above the hopper and the second layer below, while in the Cowles patent this order of applying the fibrous material is reversed, owing to the fact that the movement of the wire is upward through the hopper. In the English patent, it is true, the two layers are applied the first longitudinally on the wire and the second layer by winding, whereas in the Cowles patent in suit the same two layers are applied by a braiding machine; but each of the three methods of applying the layers were equally well known at the date of the said English patent, and the three methods of applying the layers are shown in the said English patent. The Cowles patent itself provides for the employment of any known methods of applying the successive layers of fibrous material, and specially notifies the public in the specification that the patent is not to be understood as limiting the invention to any specific devices for applying the layers of fibrous material.

In this English patent No. 1333 of 1880 I find substan-
155 tially, not to say identically, the same process or method as that described in the Cowles patent in suit and made the subject of the first claim thereof, and for the reasons before given the result of the process or method described in both the said Cowles patent and the said English patent No. 1333 of 1880 must be substantially the same. Hence I find shown and described in the said English patent the invention made the subject of the second claim of the Cowles patent.

7th Int. Do you know of any patent prior to the Cowles patent in suit in which a process is described for covering wire consisting in applying a layer of fibrous material, a layer of insulating material, and then a second layer of fibrous material upon the insulating material before it sets and which does not indicate any particular insulating material?

Ans. I do. This is the case in the last patent to which I have referred, to wit, English patent No. 1333 of 1880. The specification in this English patent describes the hopper as having capacity of holding the coating material with which the wire is to be insulated, but in no way indicates what insulating material is to be employed or a preference as to such material. The patent simply exhibits a convenient means for applying any known insulating substance or material.

The same intended use of any known material is clearly indicated in English patent No. 3314 of 1870, to which I have before referred, of which the inventor says, referring to several in-
156 sulating materials, that it may be "of any other insulating medium." The same may also be said of English patent No. 1126 of 1864, to which I have before referred and in which the inventor says: "Neither do I confine myself to any particular composition for saturating the cotton."

8th Int. Has or has not, to your knowledge, paint long been in general use in the arts, to insulate wood and metals from the decomposing influences of the atmosphere?

Ans. It has, and up to this time what is commonly understood as paint is the best known material to insulate and protect metal and other materials from the influence of the atmosphere.

9th Int. What instances in the art prior to the date of the Cowles patent do you know as showing or describing the employment of paint as a constituent in the covering of wire for protective purposes?

Ans. The first patent which I recall as employing paint as an insulating material is English letters patent No. 2321 of 1858, dated October 18th, granted to Charles West for "improvement in the mode of insulating and covering wire," in which the inventor says on page 5, folio 20:

"For the purpose of preserving one or more wires or conductors when laid or placed in the interior of a rope or cable I use a covering composed of hemp or other fibrous material saturated with a composition consisting of some one or more of the metallic carbonates or oxides mixed with some of the fixed oils, either alone or

in conjunction with a volatile oil, or saturated with (what I
157 prefer) a solution of what is known as Peacocks and Buchan's composition for ships' bottoms (which I believe has been patented by those gentlemen) and which is now and has been for some years extensively used by the Peninsular and Oriental Steamship Company."

Adjourned to Friday, January 29, at 10 o'clock a. m.

FRIDAY, *January 29th*, 1886.

Met pursuant to adjournment.
Present: Counsel as before.

Witness, continuing his answer to Int. 9th, says:

By terms "metallic carbonates or oxides" is meant, as commonly understood, carbonate or oxide of lead, carbonate of lead being what is commonly called white lead, and oxide of lead being what is commonly called red lead, and either of which mixed with oil produces what is commonly called paint.

I next refer to English patent of Chatterton and Smith, No. 2056, dated Aug. 25th, 1860, which describes "improvements in the manufacture of telegraphic cables," and the invention consists in applying a layer of fibrous material saturated with paint in the act of applying the fibrous material to the wire, and in describing the invention the specification states, beginning in folio 10, page 1:

"We apply oxides or carbonates of lead or other preparation of that or other metal combined with oil or varnish, together
158 with the fibrous materials used externally of the insulating gutta-percha coatings, whether wire be employed as well as fibrous materials to give strength to the cable or not. For these purposes the fibrous materials used, whether made up in the form of tape, yarn, cord, or otherwise, is coated or saturated with the paint or composition above mentioned, and by preference in the act of applying such fibrous materials, and whether such fibrous materials are wound spirally around or laid longitudinally over the surfaces of the gutta-percha, and it is preferred to bind an uncoated tape exterior of the saturated coatings of fibre in order that the cable may be at once coiled."

This patent was for provisional protection only.

I next come to English patent No. 175, dated Jan. 22, 1861, to Chatterton and Smith, for "improvement in the manufacture of telegraphic cables."

In this case the cable is protected by a covering composed of fibrous material saturated with paint composed of carbonates or oxides of lead with oil or other material. The coating of paint and fibrous material is applied after the wire has received a coating of gutta percha.

The object and nature of the invention is thus stated in the specification beginning on page 3, folio 5:

"This invention has for its object improvements in the manufacture of telegraphic cables. For these purposes, in order that the

gutta-percha insulating coating should not be subjected to heat in the process of manufacturing a cable, as has heretofore been the case when applying hot pitch, rosin, and other matters together with or after the fibrous materials and wire coatings have been applied around the gutta-percha coated wires, we apply oxides or carbonates of lead or other preparation of that or other metal combined
159 with tar, oil, or varnish, together with the fibrous materials used externally of the insulating gutta-percha coatings, whether wire be employed as well as fibrous materials to give strength to the cable or not. For these purposes the fibrous material used, whether made up in the form of tape, yarn, cord, or otherwise, is coated or saturated with the paint or composition above mentioned, and by preference in the act of applying such fibrous materials, and whether such fibrous materials are wound spirally around or laid longitudinally over the surfaces of the gutta-percha, and it is preferred to bind an uncoated tape exterior of the saturated coatings of fibre in order that the cable may be at once coiled."

Then, in describing the application of fibrous material and paint, the specification says, on page 3, folio 25, as follows:

"We prepare a paint, by preference of oxide of lead (red lead), though carbonates or other preparations of lead may be used, or oxides or other preparations of other metals suitable for paint may be employed in place thereof with boiled linseed oil, or it may be varnish or other suitable fluid, such as Stockholm tar, taking care to avoid the use of turpentine and other fluids which are solvents of or act injuriously on gutta-percha. We would state that we make no claim to the paints above mentioned, they, separately and apart from their use in carrying out our invention, not being new. The peculiarity of our invention consists in the manner in which such paints are used in combination with fibrous materials in the manufacture of telegraph cables, whether wire be applied or not, to give strength to such electric telegraph cables."

And as to the method of applying the fibrous material and paint the specification on page 4, folio 5, says:

"The fibrous materials may be in a form of tape, yarn,
160 cord, or otherwise, and the most convenient manner of performing this process is to cause the tapes or yarns or cords or other forms into which the fibre is manufactured to pass through a bath of such paint immediately previous to their being paid or served or otherwise applied, either longitudinally or spirally, or both, around the gutta percha; and there may be one or more layers of such coated or saturated fibrous matters employed on or around the gutta-percha covered electric conductor."

The description so far has been for the application of the paint and fibrous material to a previously coated wire; but the specification also describes the application of the paint and fibrous material in one or more coatings directly to wire without such previous treatment or coating.

The wires to be thus directly protected by layers of fibrous material and paint are described as forming a part of an electric cable to give strength to the cable. The specification describes the direct

application of the paint and fibrous material to the wire on page 4, beginning folio 10, as follows:

"When iron or steel wires are used to give strength to the electric telegraph cable, whether such wires be laid around spirally or longitudinally, we prefer that they should each be first covered with fibrous materials saturated or coated with the paint above mentioned, and this may, we believe, be most advantageously performed by causing each wire to pass through a bath of the paint above mentioned as it is about to be paid or served or otherwise coated with tape, cord, or yarn or other suitable preparation of fibre, and the tapes, cords, yarns, or other preparations of fibres thus used on the wires should be also passed through a bath of or be otherwise coated with the paint above mentioned, as the same are applied to
161 the wires, by which means the paint will be wet both on the wires and on the preparations of fibrous materials as they are brought together."

And in summing up and in particularly defining their invention the inventors state on page 4, beginning in folio 35:

"We would remark that we make no claim to the use of fibrous materials when uncombined with the paint, whether applied to the individual wires of an electric telegraph cable or to the wires after they have been applied to the core of gutta-percha containing the electric conductor."

Undoubtedly this patent is the completion of the application on which the provisional protection of 1856 was granted, and to which I last referred.

I next refer to English patent of Alfred Foucaut, dated July 2d, 1869, No. 2008, for "improvement in telegraphic cables." In this patent there are described several insulating compositions applied directly to the wire, wrapped with cotton thread. One of the insulating compositions specified is composed of carbonate of lead mixed with litharge oil and sawdust.

In describing the invention the specification says, on page 3, folio 25:

"In making a cable of one or more conductors I use as conductors single copper or other metallic wires, or I twist several smaller wires together to form one conductor of the proper size. I cover each conductor with a coating of gutta-percha or other insulating material, and I wrap a cotton thread upon it so as to completely cover
162 the gutta-percha, or I form a composition of ceruse or carbonate of lead finely powdered or mixed with litharge oil and sawdust to the proper consistency, which is to be applied in the same manner and in lieu of the gutta-percha."

And in stating the points of invention the inventor recites as his third claim the "employment of a band saturated with a mixture or compound of * * * carbonate of lead and litharge or other oils, when arranged in telegraphic cables, in the manner and for the purpose herein described;" and, "fifthly, I claim as an insulating material used in the construction of telegraphic cables the composition composed of carbonate of lead * * * or other similar hard-

ening substance, litharge or other oil, sawdust or other analagous fibrous substance."

I next come to English patent of Henry Highton, dated August 27, 1872, No. 2547, for "improvements in submarine and other cables for the conveyance of electric-ty." The object of this invention is to protect insulated wire; and such protection consists in the application to the insulated wire of a coating of lead and oil paint.

In stating the object and nature of the invention the specification says, on page 3, folio 5:

"This invention has for its object improvements in submarine and other cables for the conveyance of electricity. For this purpose I apply to the insulated conducting wire over the insulatory coating of gutta-percha, India rubber, or similar material a coating of boiled linseed oil or other drying oil mixed with red lead."

The specification clearly indicates the fact that the paint fills the pores or interstices which may exist in the insulating ma-
163 terial, and also specifically provides that the wire may be coated with the paint before the other insulating material mentioned is applied, such other material being gutta-percha or India rubber. This quality and application of the paint is described in the specification on page 3, folio 35, as follows:

"The composition fills any minute pores in the insulator and greatly improves the insulation, and in many cases a single thin covering of gutta-percha thus coated will suffice to give a practically perfect and durable insulation. Sometimes I coat the conductor with the composition before applying the insulator."

I have called the composition referred to in the patent "paint," for the reason that it is said to be red lead mixed with drying oil, and such composition is commonly known as paint.

In summing up what the inventor claims as his invention in folio 5 of page 4 "is the use in the construction of submarine and other cables for the conveyance of electricity of composition substantially as described to fill any minute pores in the insulator or to improve the insulation."

I next refer to English patent dated Sept. 19, 1873, No. 3083, granted to Alexander Wilkinson, for "improvements in coating and preserving telegraph wires, ropes, and cables."

The invention relates to coating and preserving telegraph wires by covering the wire with a fabric of fibrous covering, coated with a solution or paint of which white lead is the base, and which coating fills the interstices of the wrapping or fibrous covering.

164 In the preliminary specification the nature of the invention is briefly stated, beginning on page 1, folio 10, as follows:

"This invention relates, firstly, to coating and preserving telegraph wires, and consists in coating the fabric-covered wire with a solution of white lead, pitch, boiled or raw linseed oil, tallow, and nap-tha, the ingredients being mixed in suitable proportions and heated, so as to make, after the coating is effected and exposed to the atmosphere, a comparatively hard, yet flexible, exterior, perfectly

water-proof, and capable of withstanding extreme cold without becoming rigid or liable to crack."

And then proceeds to state the second part of his invention, on page 2, folio 10, as follows:

"The invention relates, secondly, to coating a number of threads, filaments, strips, or sheets of fabric to cover the above wires, and consists in passing them—*i. e.*, the threads—through a bath containing white lead, pitch, and boiled or raw linseed oil, first rendered into a plastic body by heat and then allowed to cool down before the filamentous bodies are passed through. The coated filaments are then, when dry, wrapped round the other wire arranged upon a rope or cable composed of a series of the first-mentioned coated wires and then passed through a bath of the last-mentioned ingredients in a heated or a cold state, whereby the thread-covered rope or cable becomes coated and all the interstices of the wrapping filled in. The rope or cable is then run through a bath of white lead in solution to give it a final exterior coating in order to render it both fire-proof and water-proof."

And the inventor says, on the same page:

"This second part of my invention is specially applicable for land lines, both overhead and underground, but it may be used in connection with submarine lines if desired."

165 And on the last page of the specification, folio 5, the inventor says:

"My invention further consists in the employment of a mixture compose of white lead and boiled oil and gutta-percha, which when well boiled together form a coating applicable for the protection of submarine and land telegraph wire, ropes, and cables, the wire, rope, or cable being drawn through a bath containing the ingredients, as before mentioned, they are placed in a bath or tank containing hot water or steam and then drawn through dies by pressure in order to compress and thus fill up the open pores of the ropes, strands, or cables."

In English patent No. 274 of 1870, dated Jan. 31st, for "improvements applicable to telegraph purposes," in which, after enumerating several water-proof compositions to insulate electrical conductors, the inventor says, "or I use any kind of oil, varnish, or paint mixed with any pigment."

In English patent No. 2124 of 1856, dated Sept. 11th, paint is described as employed to protect fibrous covered wires, the paint mentioned being "zinc white," the fibrous covering being cords of fibre rendered water-proof before they are applied to the wire.

In stating the method of protection to the fibrous covered wire the specification says, in folio 25, page 3, as follows:

"To protect wires to be used suspended from posts or otherwise they are enclosed in cords of hemp or other fibre water-proofed with the composition before mentioned and afterwards painted with zinc white."

Zinc white has for many years been well known as a paint.

166 In the several patents to which I have referred I find the use of paint clearly described as a protection for wire for

electrical purposes, and also that it was well known as a fire-proof protection for such wires, and that its insulating properties, as well as its capacity to fill the interstices in the covering of this class of wire, were equally well known prior to 1874. All the instances which I have cited as showing this use of paint to protect or insulate wire or its covering being prior to 1874.

Adjourned.

167 NEW HAVEN, CONN., *March* 17, 1886.

Met pursuant to adjournment.

Present: Counsel for the parties.

Direct examination of witness continued:

Int. 10. I observe that in the specification of the Cowles patent the following paragraph appears: "I am aware that wire has been covered with braided threads; also that India rubber, asphaltum, and similar materials have been applied upon the covering either hot or cold; but one coating of such material was allowed to set or harden before the next layer of braided material was applied; hence the asphaltum or similar material was not forced into the insterstices." Please state how you understand the invention specified in the Cowles patent to be limited or qualified by this paragraph.

Ans. By the paragraph quoted I understand the inventor to define the state of the art bearing upon his invention as existing at the time he made the invention, and to distinguish between his own invention and such prior state of the art.

By the statement quoted from the specification the inventor practically states that prior to his invention wire had been covered with braided threads; secondly, two or more layers of braided material had been successively applied to wire; and,

Thirdly, insulating material of various kinds had been applied to one of the layers of braided material before the next layer
168 was applied. These three steps in the process of covering, known to him as existing in the art prior to his invention, are identically the same three steps which he describes in his own process of covering wire; but in the paragraph quoted he distinguishes between his alleged invention and the supposed state of the art by limiting his invention to the application of the second layer of braided material upon the coating of insulating material while the said insulating material is in a green state, whereas in the process as he supposed it to exist in the art the insulating material applied to one layer of the coating material was allowed to set or harden before the next layer of braided material was applied. I therefore understand the paragraph quoted to be the inventor's statement that his process differs from the process as known to him in the art in the single point only as to the time when the third step in the process is performed—that is to say, the novelty in the process of his invention consists in applying a layer of braiding material upon a coating of insulating material before that insulating material is allowed to set or harden instead of after the insulating material has set or hardened.

Int. 11. From your knowledge and the examinations you have made of the state of the art, is it your opinion that this premise which this improvement is thus made to rest upon is true as a matter of fact, and if in your opinion it is not, please refer to the various patents cited in the case by way of answer, which show the falsity of said premise.

169 Ans. The premise upon which the invention is made to rest is false. It does not correctly state the then well-known method or process for covering wire for the reason that not only long prior to the patent in question had wire been covered with braided thread and various kinds of insulating or coating material, but the layers of braiding material had been applied to the insulating or coating material before it had been allowed to set or harden, and while that coating was in a green or plastic state, and so that the coating material was necessarily forced into the interstices.

In my answer to sixth interrogatory I have referred to numerous instances illustrating and describing processes for covering wire which consist in—

First step. Applying fibrous material to the wire.

Second step. Applying a coating of insulating material.

Third step. Applying a layer of fibrous material upon the insulating material while in a green, plastic, or unset state. English patent of Brown and Williams, No. 12991 of 1850, describes a method of covering wire for electrical purposes which consists in the application of several coverings of fibrous material having combined therewith insulating material applied during the process of covering, and so that the coverings of fibrous material are laid while the insulating material is in a green or unset condition.

In English patent to John Wallace Duncan, No. 906 of 1853, there is described and shown a method and apparatus for insulat-

170 ing conductors which consists in applying a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material upon the insulating material before the said insulating material is set or hardened.

In English patent to Felix Baudouin, No. 933 of 1857, I find the same process illustrating and describing the same three steps and the steps in the same relation to each as to time.

English patent to William Horstman, No. 434 of 1859, describes the same process and the same steps in the process as that described in the preceding patents.

The same may be said of English patent No. 464 of 1863, to Charles William Siemens, and of English patent No. 1126 of 1864, to William Thomas Henley, and in English patent No. 2942 of 1867, to Jaloureau and Lardy; United States letters patent No. 79126, June 23, 1868; also in English patent 3314 of 1870, to Joseph Rogers; also English patent 1333 of 1880, to George Frederick James. All of these patents illustrate the falsity of the statement quoted from the specification and intended to des-ribe the prior state of the art. They all describe the fibrous material as being laid while the insulating material is in a green or plastic state.

Int. 12. You have heretofore stated in your testimony the known art at the date of the Cowles patent in reference to insulating coverings for electrical conducting wires. Do you find in view of such prior art any patentable invention or any new thing disclosed in the Cowles patent?

171 Ans. The Cowles patent in suit describes the fibrous coverings as layers applied successively, without limitation as to method of applying such fibrous material, and it mentions "paint" as the insulating material, the paint being "preferably white lead or white zinc," and the process or method describes three steps.

First. Applying a layer of fibrous material.

Second. A layer of paint; and

Third. A layer of fibrous material upon the paint before it dries.

And this process is the subject of the first claim of the patent in suit.

The second claim is for the result of product of this process. I have shown in the art and the specification of the patent in suit itself admits that the successive coverings of fibrous material were well known in the art prior to the alledged invention of the patent in suit.

I have also shown by numerous references that lead and zinc paint were well known in the art as insulating or coating materials for wire for electrical purposes long prior to the alledged invention of the patent in suit, and I have also shown that the process for covering and insulating wire for electrical purposes, consisting of the three steps—

First. Applying a layer of fibrous material.

Second. A layer of insulating material; and

Third. A layer of fibrous material upon the insulating ma-

172 terial while the said insulating material was green or unset, was well known in the art prior to the alleged invention of the patent in suit.

If I understand "invention" as applied to a process the application of a known process to a like or analogous purpose without change in the method or steps and without accomplishing a result new and substantially distinct in its nature does not constitute invention, notwithstanding what may be the fact that the form or result of such application has not before been contemplated, and, further, that the substitution of one known material for another known material in one or more of the steps of the process does not constitute invention.

Therefore finding the identical process described and claimed in the Cowles patent in suit to have been well known long prior to the alleged invention of Cowles, and that the material employed in the respective steps in the process were equally well known, and that the result of the process can be but one thing, and that that result or one thing was the result and necessarily so of the process known long before the alleged invention of Cowles, I am clearly of the opinion that the said Cowles patent does not disclose anything new or any patentable subject of invention.

(Counsel for the defendants now produces and offers in evidence English patents as follows:

No. 12991 of 1850 and which is marked Defendant's Ex-
173 hibit Brown and Williams Patent, F. C. E., N. P., March 17, 1886.

No. 1015 of 1866, marked Defendant's Exhibit Sherman Patent, F. C. E., N. P., March 17, 1886.

No. 694 of 1867, marked Defendant's Exhibit Nicoll Patent, F. C. E., N. P., March 17, 1886.

No. 185 of 1853, marked Defendant's Exhibit Henley Patent, F. C. E., N. P., March 17, 1886.

No. 434 of 1859, marked Defendant's Exhibit Horstman Patent, F. C. E., N. P., March 17, 1886.

No. 942 of 1859, marked Defendant's Exhibit Sinnock Patent, F. C. E., N. P., March 17, 1886.

No. 2773 of 1858, marked Defendant's Exhibit Fletcher Patent, F. C. E., N. P., March 17, 1886.

No. 1924 of 1858, marked Defendant's Exhibit Macintosh Patent, F. C. E., N. P., March 17, 1886.

No. 2192 of 1858, marked Defendant's Exhibit Rogers Patent, F. C. E., N. P., March 17, 1886.

174 No. 2321 of 1858, marked Defendant's Exhibit West Patent, F. C. E., N. P., March 17, 1886.

No. 2208 of 1858, marked Defendant's Exhibit Oldershaw Patent, F. C. E., N. P., March 17, 1886.

No. 906 of 1853, marked Defendant's Exhibit Duncan Patent, F. C. E., N. P., March 17, 1886.

No. 933 of 1857, marked Defendant's Exhibit Baudouin Patent, F. C. E., N. P., March 17, 1886.

No. 464 of 1863, marked Defendant's Exhibit Siemens Patent, F. C. E., N. P., March 17, 1886.

No. 1126 of 1864, marked Defendant's Exhibit Henley Patent, F. C. E., N. P., March 17, 1886.

No. 2942 of 1867, marked Defendant's Exhibit Jaloureau and Lardy Patent, F. C. E., N. P., March 17, 1886.

No. 3314 of 1870, marked Defendant's Exhibit Rogers Patent, F. C. E., N. P., March 17, 1886.

No. 1333 of 1880, marked Defendant's Exhibit James Patent, F. C. E., March 17, 1886.

No. 2056 of 1860, marked Defendant's Exhibit Chatterton
175 and Smith Patent, No. 2056 of 1860, F. C. E., N. P., March 17, 1886.

No. 175 of 1861, marked Defendant's Exhibit Chatterton and Smith Patent, No. 175 of 1861, F. C. E., N. P., March 17, 1886.

No. 2008 of 1869, marked Defendant's Exhibit Foucaut Patent, F. C. E., N. P., March 17, 1886.

No. 2547 of 1872, marked Defendant's Exhibit Highton Patent, F. C. E., N. P., March 17, 1886.

No. 3083 of 1873, marked Defendant's Exhibit Wilkinson Patent, F. C. E., N. P., March 17, 1886.

No. 274 of 1870, marked Defendant's Exhibit Walker Patent, F. C. E., N. P., March 17, 1886.

No. 2124 of 1856, marked Defendant's Exhibit Balestrini Patent, F. C. E., N. P., March 17, 1886.

Letters patent of the United States No. 79126, to Alfred Fauvin Jaloureau, June 23, 1868, marked Defendant's Exhibit Jaloureau United States Patent, F. C. E., N. P., March 17, 1886.)

Adjourned.

JOHN E. EARLE.

Attest: FRED. C. EARLE,
Notary Public.

176 NEW HAVEN, CONN., *June* 23, 1886.

Met pursuant to adjournment.

Present: Counsel for the parties.

THOMAS W. BRYANT, a witness produced by and on behalf of the defendants, being duly cautioned and sworn, in answer to interrogatories propounded by M. W. SEYMOUR, Esq., of counsel for the defendants, testifies as follows:

1st Int. What is your name, age, residence, and occupation?

Ans. Thomas W. Bryant; 26; Ansonia, Conn.; superintendent of The Electrical Supply Co., the defendants in this suit.

2d Int. Have you read the testimony given by Mr. John E. Earle in this case, and are you the Thomas W. Bryant referred to by him in answer to interrogatory No. 6, folio 89, of his testimony?

Ans. I have, and I am the same person.

3d Int. When did you go into the employment of the Electrical Supply Co.?

Ans. August 2d, 1880.

4th Int. At that time was The Electrical Supply Co. engaged in the manufacture of wire for electrical purposes?

Ans. They were.

5th Int. What was your business or employment in the Electrical Supply Co.?

177 Ans. It was general overseer of the workshop.

6th Int. Did you make or attempt to make any changes or improvements in the working of the machines you found in the factory when you went there?

Ans. At the time I went there the machines were doing very unsatisfactory work; numerous changes and improvements were made under my direction.

7th Int. Did you make or cause to be made under your directions the changes and improvements for which you subsequently sought to obtain letters patent through Mr. Earle?

Ans. I did.

8th Int. Please state what those improvements were.

Ans. We were using a machine with feed-rolls which clutched the covered wire which injured such covering. To obviate this difficulty I conceived the idea that a machine the rolls of which would clutch the bare wire would be an improvement.

I had such a machine built, with feed-rolls or take-off rolls at the bottom instead of the top of the machine, the wire being fed from

bottom to top, and applied for a patent, and it was because of this that Mr. Earle came over to Ansonia to examine the machine.

9th Int. Have you read Mr. Earle's description of it in the application he prepared, and does that substantially describe the machine?

Ans. I have, and the same description is substantially accurate.

178 10th Int. How many decks of winders or braiders did this machine have?

Ans. It had two decks of winders.

11th Int. Can you state the date when Mr. Earle visited the factory?

Ans. I cannot.

12th Int. Have you any means of fixing a positive date before which you are certain that this improvement was made?

Ans. I have a copy of a letter to the Rhode Island Braiding Machine Company in our letter-press book, which I now produce and read so much thereof as I deem pertinent:

ANSONIA, *Oct.* 22*nd*, 1881.

R. I. Braiding Machine Co.

GENTLEMEN: Confirming our telegram of this p. m., will say we think the rolls under the machine are an improvement, and wish you to build the six machines now ordered of you for large wire, like the last sent. You omitted, etc.

* * * * * * *

We claim invention and improvement of your winder by placing the feed-rolls below the cotton, so they will clutch the bare wire and leave the cotton in an undisturbed condition. We consider

179 this alteration as a great improvement, and do not wish other parties to have the benefit of our invention and knowledge. So, for this reason, would like to protect ourselves by letters patent, etc.

* * * * * * *

Yours truly,

(Signed) THOMAS W. BRYANT, *Sup't.*

(Defendant offers in evidence letter-press copy of said letter for the purpose of fixing date, and said letter-press copy is marked "Defendant's Exhibit Bryant Letter, F. C. E., N. P., June 23, 1886."

It is stipulated that said letter book containing said letter shall remain in the possession of the defendant, to be produced at any time, at the request of the court or of the counsel for the complainant.)

13th Int. Was there at that date, October 22d, 1881, one or more braiding or winding machines at work in your factory at Ansonia producing covered wire having the feed described by Mr. Earle as working upon the bare wire underneath the machine attached thereto?

180 Ans. I am positive that there was at that date one or more machines working as described.

14th Int. Give the best idea you can when this invention and improvement was made by you and put into practical operation.

Ans. It must have been early in 1881 that I was at work improving this machine, and believe that it was in successful operation in

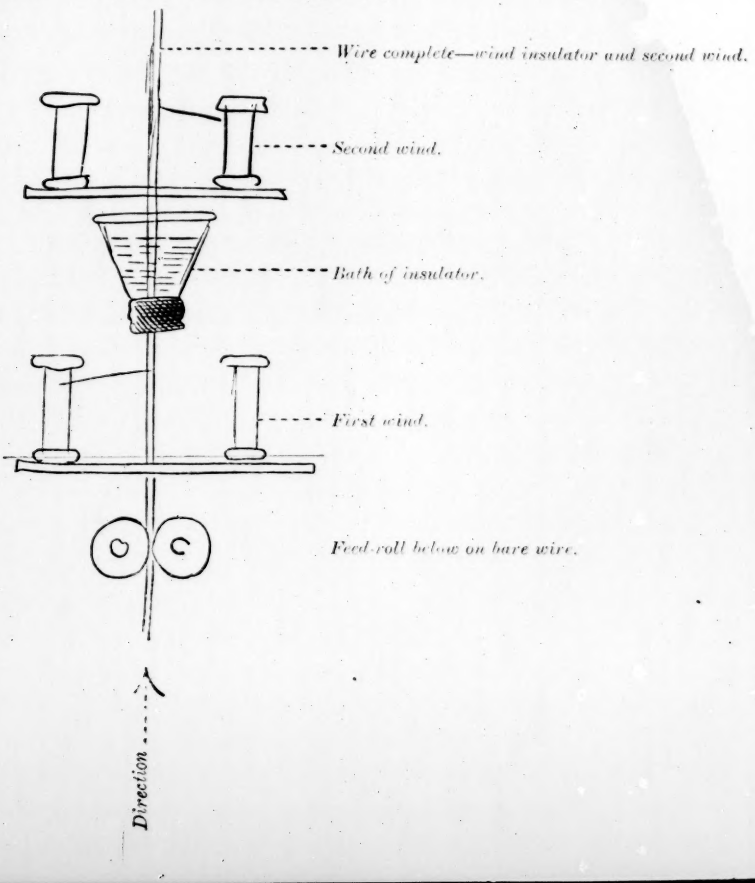
the summer of that year, as we shipped wire of a character that must have been made on that machine.

15th Int. You have spoken of this machine as having two decks or a double set of winders. Was there any arrangement connected with it for applying an insulating material or substance to the wire as it was being covered and as a part of the same operation? If so, please state how it was applied.

Ans. The machine was what we call a double winder. There was, in connection with the two winding tables or decks, a tin vessel placed between the upper and lower deck, or so that it would come between the two winds, arranged to hold a liquid bath. The wire passed through the lower table, giving it a wind of cotton in one direction, then through the bath, then through the upper winder, giving it a wind in the opposite direction.

The material contained in the bath was a good insulator and was applied in liquid form, and this combination made an improved wire. I can give a better description by diagram.

181 (Witness makes diagram.)



(Counsel for complainant objects to the foregoing, because
182 no notice is given in the answer, if it shall be claimed that anticipation is proven by anything set forth in the answer or diagram.)

16th Int. In what condition was the insulating machine when the second covering was placed upon it?

Ans. It was still green or in an undried condition when the second winding took place.

Adjourned.

NEW HAVEN, *July* 15, 1886.

Met pursuant to adjournment.

Present: Counsel for the parties.

Cross-examination of Mr. BRYANT by Mr. MITCHELL:

17th X Int. When you went into the employ of the Electrical Supply Co., in August, 1880, what kinds of wires for electrical purposes were they manufacturing?

Ans. Generally speaking, two kinds—wound and braided.

18th X Int. Did they use paraffine ar any other substances in connection with the braided or wound coverings upon the wires?

Ans. We used various compounds of that character—that is, with paraffine as an ingredient.

183 19th X Int. Did the defendant company, when you went into their employ in August, 1880, make wire for use in electric lighting?

Ans. I think not.

29th X Int. For what uses did they make electric conductors at that time?

Ans. For magnets and for house purposes.

21st X Int. What do you mean for house purposes?

Ans. For house bells and house enunciators, calls, etc.

22d X Int. Did the defendants manufacture electric lighting conductors in the year 1880, at any time?

Ans. I think not; although they might have done so in the latter part of the year.

23d X Int. Whenever they did begin to make electric lighting conductors, did they employ paraffine as one of the constituents of the covering of the wire?

Ans. They did.

24th X Int. How was the paraffine applied when they first began to make conductors for electric lighting purposes?

Ans. The paraffine was heated, the wire with the insulation was dipped in it and allowed to soak until insulation became thoroughly saturated; it was then taken out, and the paraffine set when cold.

25th X Int. What do you mean in your last answer by the expression "wire with insulation"?

Ans. I mean the wire with its covering of cotton or other material independent of the paraffine insulation.

184 26th X Int. Describe a little more in detail how the covered wire was dipped into the bath of paraffine?

Ans. The wire was in the form of a coil, tied, and the coil was immersed in the paraffine, and removed after the saturation.

27th X Int. About how much covered wire was formed into the coil before it was dipped into the paraffine bath?

Ans. Say a fifty-pound coil.

28th X Int. About how many feet would there be in a fifty-pound coil of the covered wire of the size which you have in mind in making your last answer?

Ans. Say number five, fifty pounds of the bare wire make, I believe, by the table, about five hundred feet.

29th X Int. What is the diameter of number five wire?

Ans. It is somewhere in the neighborhood of two-tenths of an inch.

30th X Int. Then, if I understand you, the process first employed by the defendant in producing a conductor for electric lighting purposes consisted in passing the naked wire through a braider or winder, thereby applying a wound or braided fibrous covering, the covered wire being wound up in coils as it came from the machine, after which the coils containing five hundred feet, more or less, of fibre-covered wire were dipped in a paraffine bath, and removed after the paraffine had had an opportunity to penetrate the covering; am I right?

185 Ans. The description of process is substantially correct of one of our first methods of making conductors for electric lighting.

31st X Int. I have understood you to say that the method which I have endeavored to state concisely in the last question was the first one used by the defendant. Is my understanding correct in that respect? I refer, of course, to electric lighting conductors.

Ans. I think very likely that was our first process.

32d X Int. Was that the process practiced usually at that date by manufacturers of electric lighting conductors, so far as you know?

Ans. I don't know the process of other manufacturers at that date.

33d X Int. Do you know whether the electric light conductors which were sold by other manufacturers were coated with paraffine or were treated with paraffine in producing their covering?

Ans. I can't say whether they were or not, but I presume they were.

34th X Int. In reply to interrogatory 15 you say that the bath, or rather the material contained in the bath, was a good insulator and applied in liquid form. What was that insulator?

Ans. We used different insulators at different times.

35th X Int. Was benzine one of its ingredients?

Ans. I think not.

186 36th X Int. Look at the copy in defendants' letter book of a letter written to John E. Earle, dated Ansonia, October 21, 1881, and purporting to be signed by you as superintendent, and

say if the copy referred to is a copy of an original letter written and sent by you to Mr. Earle at the time when it bears date.

Ans. It was written by me.

37th X Int. Look at the copy contained on page 184 of the same book and say whether it is a copy of an inclosure contained in a letter sent to Mr. Earle and referred to in the letter.

Ans. Yes; it is.

38th X Int. In that letter you request Mr. Earle to make out a paper for a patent. Say whether he did so or not.

Ans. I think that he did.

39th X Int. Was a patent obtained?

Ans. I think it was.

40th X Int. To whom?

Ans. To James Taylor, I think, and he subsequently, I think, as signed it to the Electrical Supply Co.

(Defendants' counsel objects to questions X Int. 32, 33, 34, 35, 36, and 37 and the answers thereto as irrelevant and having no bearing upon the case and as referring to a patent granted to a party other than the defendants, and gives notice that he will make a
187 motion at some subsequent time to have the same erased from the record.)

(Counsel for complainant places in evidence the letter-press copy of the letter referred to, dated Oct. 21, 1881, to Mr. John E. Earle, signed Thomas W. Bryant, superintendent, including the inclosure drawings on page 184, and the same is marked "Complainant's Exhibit Bryant-Earle Letter and Inclosure, F. C. E., N. P." It is agreed that a copy may be substituted for the letter-press copy.)

(But the defendant's counsel objects to the introduction of said letter as irrelevant and immaterial.)

41st X Int. See if the letter, a letter-press copy of which if found on page 197 of defendant's letter book, to the "R. I. Braiding Machine Company" was written and sent by you at the time which it bears date, to wit, October 26th, 1881.

Ans. It probably was.

42d X Int. Have you any doubt that you wrote it and sent it at the time indicated by the date, or substantially that time?

188 Ans. No; no doubt but that it was written and sent at about that time.

(Counsel for complainant places in evidence the letter-press copy of the letter referred to, dated October 26th, 1881, to the "R. I. Braiding Machine Company," signed "Thomas W. Bryant, supt.," and the same is marked "Complainant's Exhibit Bryant-Braiding Machine Co. Letter F. C. E., N. P."

It is agreed that a copy may be substituted for the letter-press copy in evidence.)

43d X Int. When did the defendants begin to coat electric lighting wire by applying a coat of paint between two braided coverings, the paint being contained in a vessel through which the wire passed after receiving the first braided covering and before receiving the

second braided covering—the second braided covering being applied before the paint had become dry?

Ans. I am unable to say or fix a date when the paint pot was first used for applying a coat of paint between two braided coverings.

44th X Int. Was it prior to the spring of 1883?

Ans. Yes, sir.

189 45th X Int. Fix the date as nearly as you can when an electric conductor was first made by defendants which involved the application of a coat of paint, applied between two layers of braid, and described as in the previous question, X Int. 40.

Ans. I should place the time somewhere between the summer of 1881 and the spring of 1882—I can't say nearer, as the change from the first method to the paint pot was not remarkable or noted.

46th X Int. Then if I understand you you cannot testify to the use of the paint pot between the two layers prior to the spring of 1882?

Ans. I know that we used that same device called a paint pot for holding insulating material in October, 1881, which applied the insulation between the two coverings.

47th X Int. What was used as an insulator in October, 1881?

Ans. We used various compounds and mixtures.

48th X Int. What were they?

Ans. Principally gum arabic in solution, some gum tragacanth, and a little shellac and alcohol.

49th X Int. Was anything done to this wire subsequently in order to prepare it for the market?

Ans. I think not as a general thing.

50th X Int. By what name was this wire known?

Ans. Known to the trade as magnet wire.

190 51st X Int. Name some of the persons or firms to whom such wire was furnished as early as 1881.

Ans. I can't tell without reference, our wire generally being sold from our warehouse in New York.

52d X Int. This was not electric lighting wire, if I am right, this wire which you have said was called magnet wire?

Ans. It was used in the manufacture of electric lighting machines, but not used as leads.

53d X Int. It was not used, if I am right, as an electric conductor to convey electricity in an external circuit?

Ans. No.

54th X Int. Is that wiremade now by you?

Ans. Magnet wire is now made by us.

55th X Int. Now, to come back, am I right in understanding that you cannot say that the defendants used a process that involved the application of a coat of paint, either lead or zinc, between the applications of two layers of braid prior to the spring of 1882 or thereabouts?

Ans. I said that they did use it prior to that time.

56th X Int. In reply to X Int. 45 you said that you should place the time somewhere between the summer of 1881 and the spring of

1882. From that I inferred that you could not fix a time which you would be willing to swear to as fixing a date earlier than the spring of 1882. Can you now name an earlier date as one which you can testify to definitely and positively?

Ans. I am quite sure that it was earlier than the spring
191 of 1882, but I have no means of fixing a date when we began to manufacture after just the method you describe, as we were manufacturing wire with paint on, I am positive, in the fall of 1881.

57th X Int. In what way was paint applied by the process which you are positive was in use in the fall of 1881?

Ans. We were using at that time single and double braiders. We gave our wire on the single braiders a braid, then run it through a trough filled with paint, then run it through the single braiders again while green, then put it through the trough of paint again, then drying the wire in an oven. Our double braided wire at first was given only a bath of the paint.

58th X Int. Do you mean that when you applied a double braid by means of the double braider you dipped the coil after both braids had been applied into a bath of paint?

Ans. Yes; I do.

59th X Int. When you used the single braider was the wire coiled and uncoiled before it passed for a second time through the single braider?

Ans. It was. It was drawn from the coil through the paint and coiled a second time on a reel. The reel was placed under the braider and the wire run off without being further disturbed and being braided the second time.

60th X Int. When the first braid was applied was not the paint applied before the braid?

192 Ans. No; we trusted the paint to soak through the first covering onto the wire.

61st X Int. By what name was this wire known?

Ans. Line wire for electric wire leads.

Cross-examination closed.

THOS. W. BRYANT.

Attest: FRED. C. EARLE,
Notary Public.

NEW HAVEN, CONN., *July* 15, 1886.

ALEXANDER RAE, a witness produced by and on behalf of the defendants, in answer to interrogatories propounded by M. W. SEYMOUR, of counsel for the defendants, testifies as follows:

1st Int. What is your name, age, residence, and occupation?

Ans. Alexander Rae; twenty-three; Ansonia; apprentice in the business of tool-making.

2d Int. Have you ever been in the employment of the Electrical Supply Co.?

Ans. I have.

3d Int. During what time?

Ans. From November, 1880, to March, 1881; from April, 1881, to August, 1885.

4th Int. Are you at present in their employment?

193 Ans. I am not.

5th Int. Have you any interest whatever in their business?

Ans. I have not.

6th Int. What particular branch of the business were you employed in while working for the Electrical Supply Co.? Describe generally what you did.

Ans. Handy man around the shop. I repaired different machines and done what was to be done around the shop.

7th. Int. Were you ever employed in making electrical wire?

Ans. I was.

8th Int. Do you know of your own knowledge of wire having been insulated by the use of paint whilst you were in the employment of the Electrical Supply Co.?

Ans. I do.

9th Int. State how early you recollect its having been so employed, who did it, and describe in your own way the manner in which it was done.

Ans. In the spring of 1881. I myself did it, by first braiding, then running through a trough of paint, wiping with a sponge, then braiding, and painting again through a trough, drying and finishing.

10th Int. State a date before which you are positive that you thus prepared wire for electrical purposes, and your reasons, if you have any, for being able to fix that date.

194 Ans. March 20th, 1881; and I fix that date because I left the employ of the Electrical Supply Co. before that date.

11th Int. Mr. Bryant in his testimony has described somewhat the machines and apparatus for holding the insulating material which were used in making electrical wire. Do you remember those machines well enough to describe them?

Ans. I do.

12th Int. Please describe the manner of insulating wire as conducted there, to the best of your ability.

Ans. It was a machine consisting of two revolving heads, the wire passing vertically through the machine, one winding, then passing through an insulating pot and winding again.

13th Int. Do you remember anything about the feed-rolls?

Ans. I do.

14th Int. Where were they placed?

Ans. They were placed under the machine.

15th Int. Describe what you have already described in answer to interrogatory 12 as "an insulating pot."

Ans. The insulating pot was a can of tin with a brass valve-like attachment at the bottom.

16th Int. How early do you think that "insulating pot" was put on these machines?

Ans. August or September, 1881.

195 17th Int. During the latter part of the time while you were in the employment of the Electrical Supply Co. what position did you occupy?

Ans. Foreman of the braiding department.

Cross-examination by Mr. PUSEY:

18th X Int. Under whose instructions or at whose suggestion did you run the wire through a pot of paint, &c., as described in interrogatory 9?

Ans. Under Mr. Bryant's.

19th X Int. Did you resume that work after you came again in the employ of the Electrical Supply Co. as stated by you?

Ans. I did.

20th X Int. How long did you continue it?

Ans. More or less till 1885—August.

21st X Int. My question was directed to the process described by you in answer to interrogatory 9?

Ans. Well, I would answer to that question—until 1882.

22d X Int. What time in 1882, about?

Ans. In the spring.

23d X Int. What process of making electric wire did you use next after that you have referred to?

Ans. In a regular braiding machine, with paint can between the two heads.

24th X Int. That was after the spring of 1882?

Ans. It was early in the spring or in the winter of 1882.

196 25th X Int. In direct Int. 11 Mr. Seymour referred to the machines and apparatus for holding the insulating material which were used in making electrical wire. What insulating material did you refer to or have in mind in answering that question?

Ans. Shellac or gum-arabic.

26th X Int. Whilst in the employ of the Electrical Supply Co. did you manufacture or assist in the manufacture of an electric wire which was covered with braid or thread, then run through paint, and then a second covering of braid or thread put on before the paint on the first braiding was dry?

Ans. I have.

27th X Int. When?

Ans. I done it in 1881.

28th X Int. You mean, I presume, as described in your previous testimony, do you not?

Ans. In my direct testimony.

29th X Int. What was the object of wiping with a sponge as mentioned in answer to Int. 9?

Ans. To keep from running all over the floor.

30th X Int. What was this wire so covered used for or intended for?

Ans. As I understood it, it was to go into an engine-room or a boiler-room where they needed a fire-proof wire.

31st X Int. Was the paint dried before the second coat of braiding was put on?

197 Ans. Some of it was and some of it wasn't.

32d X Int. Just as it happened, I presume?

Ans. Just as it happened.

33d X Int. Was Mr. Bryant present during this manufacture sometimes?

Ans. He was.

34th X Int. How much wire, as near as you can recollect, was made in this way?

Ans. I should say some seventy-five pounds.

35th X Int. Was not the effect of the wiping with a sponge to take off the greater quantity of paint taken up by the braiding?

Ans. It was for taking off the paint, certainly, but not for taking off the larger portion of it.

36th X Int. Did you rely upon the absorption of the paint by the braiding to give sufficient paint for making the wire fire-proof?

Ans. I did.

37th X Int. When did the Electrical Supply Co. commence to manufacture wire for electric lighting having two coats of braiding with paint intervening between the two coats of braiding?

Ans. That I could not say.

38th X Int. What kind of paint was used in the manufacture described by you in answer to Int. 9?

Ans. That I cannot answer.

39th X Int. Was the wire run through paint before the first coat of braiding was put on?

198 Ans. It was not.

40th X Int. Please look at the drawing or diagram which was made in answer by Mr. Bryant to Int. 15 in his direct testimony in this cause and state whether or not you saw a machine of that description used by the Electrical Supply Co. If so, when did you first see it?

Ans. I did. I should say in August or Sept., 1881.

41st X Int. In answer to X Int. 42 Mr. Bryant, being asked to fix the date as nearly as he could when an electric conductor was first made by defendants which involved the application of a coat of paint applied between two layers of braid and described as in the previous question, X Int. 40, which I will read to you (Mr. Pusey reads), replied, in effect: Between the summer of 1881 and the spring of 1882. Now, you have stated, in answer to Int. 9 and 10, that, previous to March 20th, 1881, you made, under Mr. Bryant's instructions, as subsequently stated by you, electric wire by first braiding, then running through paint, and afterwards braiding and painting again and finishing. Now, I ask, in view of this apparent discrepancy between your testimony and Mr. Bryant's, may you not, upon reflection, have been mistaken in so positively fixing the date?

Ans. I am not.

42d X Int. Then Mr. Bryant, the very person who gave you the instructions, who is equally positive, was mistaken?

199 Ans. I think Mr. Bryant is mistaken.

Cross-examination closed.

ALEXANDER RAE.

Attest: FRED. C. EARLE,
Notary Public.

200 Circuit Court of the United States, District of Connecticut.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY COMPANY. } In Equity.

Evidence for Defendant.

Taken pursuant to the sixty-seventh rule of the Supreme Court of the United States, in equity, as amended, before me, Wilmarth H. Thurston, special examiner.

PROVIDENCE, R. I., *July 7th*, 1886.

Present: C. E. Mitchell, Esq., and Joshua Pusey, Esq., of counsel for complainant.

M. W. Seymour, Esq., of counsel for defendant.

201 *Deposition of Thomas L. Reed.*

Direct examination by M. W. SEYMOUR, Esq., of counsel for defendants:

1st Int. What is your name, age, residence, and occupation?

Ans. Thomas L. Reed; age, 58; residence, Providence, R. I.; occupation, superintendent of the E. P. Gleason Manufacturing Co., manufacturers of flexible gas tubing.

2d Int. Have you ever been engaged in the electrical supply business; and, if so, when, where, and in what particular branch of that business?

Ans. Yes, sir; in 1872—from the summer of 1872 to 1877—in the city of Providence, jointly with E. F. Phillips, in insulating wires for electrical purposes.

3d Int. What substances have you used as insulators for electrical purposes?

Ans. Rubber, for one, and its different compounds; paraffine, wax, and rosin as a compound, and paraffine and wax separately; also Canada balsam or balsam fir, oil paints, such as painters use, and dry leads, and coloring matters, such as English vermilion or American chrome yellow for yellow, and Prussian blue for blue.

4th Int. You speak of paint as one of the substances used by you as an insulator. When and where did you first use it?

Ans. It was at the Rhode Island braiding works, where we
202 occupied a building in the rear of 89 Aborn street, from 1872. We were in that building from March, 1873, to September, 1874. I would say that the first I used in connection with a braider was between those two dates.

5th Int. Which two dates—1872 or from March, 1873, to September, 1874?

Ans. From March, 1873, to September, 1874.

6th Int. Previous to March, 1873, where were you carrying on business?

Ans. On Dyer street.

7th Int. Did you use paint as an insulator in Dyer street?

Ans. We used paint there to a small extent when we first commenced experimenting; white paint and green paint.

8th Int. In answer to Int. 4 you say you used paint in connection with a braider. Please describe the method used by you in making electric wire whilst in the Rhode Island Braiding Company's building.

Ans. I have had a drawing made to illustrate the process, which I now produce.

Said drawing thus produced is offered in evidence and marked Exhibit Reed Drawing, W. H. T., spec. ex.

In the Exhibit Reed Drawing, A is the reel and *a* the naked wire which is unwound from the reel A. The wire *a* enters the
203 tub B, passes under the spool *c*, the tub containing paint, and then passes up to the braider D through the feed-rolls E, over the sheave F, onto the reel H. When the wire was wound upon the reel H the coil of wire was taken off of the reel and thrown into the tub I, shown in Fig. 2, the tub I containing paint the same as the tub B. The wire was then passed from the tub I through the pair of clamp-jaws J and onto another reel to dry. The object of the jaws J was to scrape off the surplus paint and compress it.

9th Int. Did you have any one who worked with you or assisted you in this process of covering wire?

Ans. I must have had.

10th Int. Can you tell any of their names?

Ans. One was Henry Smith. I had some girls. One was named Sarah Flynn; another was Hannah Hubbard. Another man's name was Walter Carr.

11th Int. Do you remember the names of any persons who saw this machine work?

Ans. The shop was open, so that any one could come in. Mr. Hood, of the Rhode Island Braiding Co., the gentleman here, was frequently there. I had to have him come in to put my machinery in order. I might say that the men in his machine shop had the privilege of coming in there. I don't remember their names. Mr. E. F. Phillips, who was my partner, was also there. Mr. Phillips' father worked there at the time. He is dead now.

204 12th Int. Did you ever show or explain your method of covering wire to Mr. Hood, whom you have just spoken of?

Ans. Yes, sir.

13th Int. Do you remember of whom you purchased the paint that you speak of using?

Ans. Yes, sir; of Thomas W. Eddy, of High street, Providence.

14th Int. Did you ever use in your establishment double braiders or winders?

Ans. No, sir.

Cross-examination by Mr. PUSEY:

15th X Int. What diameter of wire was used by you in the process and in connection with the apparatus shown in Exhibit Reed Drawing?

Ans. To the best of my recollection I should say that it was about No. 16 or No. 17, Brown and Sharpe's gauge.

16th X Int. That size is much smaller than is used for electric-lighting purposes, is it not?

Ans. Yes.

17th X Int. Did you mix any drug or chemical with the paint in that process?

Ans. In experimenting I have no doubt I did, but the paint that I bought was ordinary mixed paint such as painters use.

205 18th X Int. Do you not recollect upon reflection having stated to Mr. Cowles that you mixed aloes with the paint, because the object was to furnish a braid-covered wire that rats would not attack?

Ans. I would answer that I met a gentleman, whose name I do not remember, in company with E. F. Phillips. I told them both that when Mr. Holmes, of the Holmes Burglar Alarm Co., requested Mr. Phillips to have a wire charged with materials to prevent rats and mice from eating the cotton, I did charge the green paint with aloes and arsenic; that was a double-wound wire.

19th X Int. This wire which you made was used for annunciators and things of that sort, was it not?

Ans. Yes, sir.

20th X Int. You had no thought or idea, then, of making a wire thus coated, which was adapted for use in electric lighting, wherein powerful currents were used and wherein it is important that the conducting wire or rather its coating should be proof against fire which might result from breaking the wire, especially in a short circuit?

Ans. My answer would be that at that time I knew nothing about electric-light wire, but my orders were to make for Mr. Phillips' works a fire-proof wire. I think there was a patent for silica and soda for filling the braiding. I also tried the experiment of using lime mixed with the paint. I don't know what became of the wire.

21st X Int. Did you make a small quantity of that wire or a large quantity? I mean the whole business.

Ans. I should say a hundred pounds.

206 22d X Int. This manufacture which you have described was in the nature of an experiment or experiments, was it not?

Ans. I should say that it was an experiment. He ordered it and I made it. It was an experiment so far as I went.

23d X Int. Do you know of your own knowledge that the wire which you thus made was actually put into use?

Ans. I do not.

24th X Int. Have you been engaged in the manufacture of wire, or rather covered wire, since 1877—that is, since the time you referred to in your testimony-in-chief as having made these experiments?

Ans. I have.

25th X Int. What kind of wire have you made?

Ans. Telephone and telegraph wire in the form of cables up to about two years ago.

26th X Int. How were these made?

Ans. I merely covered them and covered the outside with paint. The cable came to me laid up in the form of a cable. I then wrapped the cable with vulcanized rubber; then wound it spirally with rubber tape cloth. It was then passed up into the loom and woven upon, and was then passed down under a roll and covered with paint.

27th X Int. You mentioned some time back in your testimony that you put lime with the paint. What was the object of mixing the lime with the paint?

207 Ans. The object at the time was as an experiment for a fire-proof paint.

Redirect examination by Mr. SEYMOUR:

28th R. D. Int. Who attended to the business part of your establishment—I mean the buying and selling of the manufactured goods?

Ans. Mr. E. F. Phillips bought the wire and the cotton. I was in the habit of buying the wax and the paraffine and the other materials which we used. Mr. Phillips did all the selling. I attended to the manufacturing.

29th R. D. Int. When he wanted a particular kind of wire made, adapted to any particular purpose, what was the custom of your business in respect to its manufacture? What did he do, and what did you do?

Ans. If he asked me to make any special kind of wire I did the best I could possibly do to make it to meet the demand.

30th R. D. Int. Were you or not requested by Mr. Phillips to make for the Western Union Co. a fire-proof wire?

(Objected to as leading and as suggestive.)

Ans. I was.

31st R. D. Int. Please state under what circumstances and what you did.

208 Ans. Mr. E. F. Phillips came home from New York and requested me to make a fire-proof wire. He asked from the fact that the paraffine had got afire from lightning or something, and I proceeded and made a double-braided wire charged with silicate of soda, or water-glass.

32d R. D. Int. What do you mean by "charged" in your last answer?

Ans. The silicate of soda is as liquid as water, and you put the

braided wire in a basin of the liquid and it will fill itself—the liquid will soak right up and fill the braid.

33d R. D. Int. Was there or was there not any paint mixed with or used with this silicate of soda?

Ans. None at all.

Recross-examination by Mr. PUSEY:

34th R. X Int. In answer to X Int. 18 you stated, in referring to the wire that you made for the Holmes Burglar Alarm Co., that it was a double-wound wire, and in answer to redirect Int. 31 you speak of the use in the manufacture of a silicate of soda charged wire of a double-braided wire. Please explain the difference, if any, in the modes of coating or charging the double-braided wire and the double-wound wire.

Ans. The double-wound wire was charged or insulated with paint and the double-braided wire was charged or insulated with silicate of soda.

209 35th R. X Int. As I understand it, in the one case the wire, with two coatings of braid thereon, was run through the silicate of soda, and, in the other case, the wire, covered with the two layers of winding of thread, was run through the paint mixed with the arsenic and aloes, and afterwards dried. Am I correct?

Ans. The only difference was that with the silicate of soda the wire was immersed in a bath, and with the paint the wire was run through a trough containing the paint.

(Signed) THOMAS L. REED.

Attest: WILMARTH H. THURSTON,
Special Examiner.

Adjourned to July 8, 1886.

PROVIDENCE, R. I., *July* 8, 1886.

Present: Counsel as before.

Deposition of Arnold S. Hood.

1st Int. What is your name, age, residence, and occupation.

Ans. Arnold S. Hood; age, 58; residence, Providence, R. I.; occupation, manufacturer of machinery, and am treasurer and
210 superintendent of the Rhode Island Braiding Machine Company, and have been such for the past twenty years.

2d Int. Do you know Mr. Thomas L. Reed, the last witness; and, if so, how long have you known him?

Ans. I do. I have known him about twenty-two years.

3d Int. Did he and his firm ever hire and occupy a portion of the premises of the Rhode Island Braiding Machine Co.?

Ans. I don't know that Mr. Reed was a member of the firm, but he worked there for Mr. Phillips.

4th Int. From what time to what time?

Ans. From March, 1873, to September, 1874.

5th Int. Have you examined your books so as to verify your recollection upon this point and be positive as to these dates?

Ans. I have.

6th Int. Whilst Mr. Reed was at work there, were you in the shop occupied by him, and did you have an opportunity to see what he was doing?

Ans. I was, and had.

7th Int. Did you or your company furnish or repair any of the machines operated by Mr. Reed?

Ans. We furnished all his machinery and did all his repairs.

8th Int. What business was Mr. Reed engaged in there at that time?

Ans. He was insulating copper wire for electrical purposes.

211 9th Int. Please look at "Exhibit Reed Drawing" now shown to you, and say whether it in the main correctly pictures one or more of the machines used by Mr. Reed whilst he occupied your premises.

Ans. That is substantially correct.

10th Int. How many employees do you think were at work in that building for Mr. Reed?

Ans. Well, I should say from six to eight persons.

11th Int. What can you say as to the amount of business carried on by him so far as you could judge?

Ans. I should say that it might be from twelve to fifteen thousand dollars sales per year. That is guess-work on my part; of course I don't know it positively.

12th Int. Was there any secrecy enjoined or preserved, so far as you know, in regard to the ingredients used by Mr. Reed in connection with his braiding machine for the purpose of producing insulation?

Ans. None that I am aware of.

13th Int. Did you know what ingredients he was using?

Ans. I do; some of them at least.

14th Int. What ingredients did he use?

Ans. Well, he used paraffine and bees-wax, paint, oil, slacked lime, and some coloring for making the paint different colors.

212 15th Int. Do you remember distinctly enough to be able to describe the method by which the paints and braids were applied to the wire? And, if so, please describe it in your own way.

Ans. There were several methods. One was to put the coils or wire onto a reel, and the wire was run from that reel into a pan or vat containing lead and lime and oil, and whatever other ingredients they might put in; from this vat up through a braiding machine onto another reel which took it away as fast as covered, and as a rule if there was not paint enough, it was not insulated enough, they put it into another tub of insulating substances, whether paint or bees-wax, whatever it was they used; then it was taken from that tub and hung up on a hook to drip, so that the dripping would drop back into the tub again; when it got through dripping it was taken and run through a pair of clamp-dies to take off any surplus bunches

and to compress the insulation and make it round and give it a smooth surface. That was the process at the time they were in our building.

16th Int. Do you know of your own knowledge where Mr. Reed and his associates moved to after leaving your factory?

Ans. They moved up to Stewart street, into the same building where Mr. Phillips is now carrying on business.

17th Int. Do you know whether they continued to carry on the same business in Stewart street that they carried on in your building?

Ans. I do.

213 18th Int. Is the same business carried on there to-day?

Ans. I understand that it is.

Cross-examination by Mr. PUSEY:

19th X Int. By the words "the same business" do you mean that of the manufacture of electric wire generally or a particular construction or kind of conducting wire?

Ans. I mean the manufacture of electric wire generally.

20th X Int. Do you know whether or not Mr. Reed used silicate of soda as an insulating material in connection with braided or wound wire whilst he was in your factory?

Ans. I don't know.

21st X Int. Mr. Reed whilst in your factory made electric wire braided or wound, the braiding being coated or saturated with paraffine, did he not?

Ans. Yes; paraffine and beeswax.

22d — Int. He continued that manufacture after he left your factory, did he not?

Ans. He did.

(Signed) ARNOLD S. HOOD.

Attest: WILMARTH H. THURSTON,
Special Examiner.

214 Circuit Court of the United States, District of Connecticut.

ANSONIA BRASS & COPPER CO. *vs.* THE ELECTRICAL SUPPLY CO. } In Equity.

Testimony taken on the part of the defendant under the 67th rule as amended and by consent of parties.

RICHFIELD, N. Y., *July 28th*, 1886.

Present: Mr. Joshua Pusey, of counsel for the complainant, and M. W. Seymour, for the defendant.

EDWIN HOLMES, a witness produced on the part of the defendant, being first duly cautioned and sworn, deposes and says:

1st Int. What is your name, age, residence, and occupation?

Ans. Edwin Holmes; age, 65 years; I reside in New York city,

and am temporarily sojourning at Richfield Springs; am in the electric business, more particularly the Holmes burglar alarm telegraph business, and have been engaged in that business for the last twenty-five years.

215 2d Int. In your business has it been necessary for you to use insulated electric conductors? And, if so, please describe the manner in which those conductors were insulated, beginning back as early as you remember.

Ans. It has. When I first commenced using them the wire was insulated by winding a thread, larger or smaller, as the case might be, around the wire, and that thread was covered with paint. All of my wire was insulated in that way until paraffine was substituted for the paint.

3d Int. How was the paint applied?

Ans. I think at first it was applied with a brush. I applied it by drawing it through a vessel containing pain- and then through a piece of thick rubber or gutta-percha, which removed the surplus paint and left a smooth surface on the thread which covered the wire.

4th Int. Please state the date anterior to which you are willing to swear positively that you insulated an electrical conductor by placing paint upon the fibrous covering or jacket which enveloped the wire.

Ans. I did it myself as early as the early part of 1860.

5th Int. Was the wire thus insulated used by you in your business?

Ans. It was, and some of it is in use to-day in my burglar-alarm business.

6th Int. Did you ever have occasion to purchase electrical conductors insulated substantially in the manner described by you, to wit, by the application of paint upon a fibrous jacket, from

216 any manufacturers of such conductors? And, if so, please state from whom you made such purchases.

Ans. I did. Before I painted it myself I purchased of Mr. Charles Williams, of Boston. Subsequently I purchased of Mr. E. F. Phillips, of Providence, R. I.; I began purchasing of him about 1872 and have purchased from him more or less ever since.

7th Int. Do you mean that you have purchased painted wire of E. F. Phillips ever since 1872?

Ans. I do not mean that I purchased painted wire ever since 1872, but that I purchased painted wire of him and until he substituted paraffine wire, which was some little time after *he* began business.

8th Int. Was this painted wire that you purchased after 1872 and until he substituted the paraffine wire used by you in your business, and is some of it still in use in places where you then put it?

Ans. It was and is.

9th Int. In your business did it ever become necessary to secure as perfect insulation of wire as possible; and, if so, what method did you take of accomplishing that result? In answering this question please confine your answer to the use of fibrous material and paint.

Ans. It did. I accomplished it sometimes by covering the wire with a thicker thread and two coats or more of paint, sometimes by a thread covering and a coat of paint, then another thread covering and a coat of paint on that.

217 10th Int. Was that second fibrous covering and second coat of paint placed upon the first covering and paint while it, the first covering of paint, was in an "undry" or "unset" condition?

(Complainant's counsel objects because the question is leading and suggestive.

Question withdrawn and the following interrogatory substituted therefor:)

10th Int. Please describe the condition of the first coating of paint when the second coating of fibrous material and paint was put upon it.

Ans. The first coat was partially dried, so as to keep its place, but would admit of an impression from the next covering of thread.

11th Int. Please state a date anterior to which you are willing to swear positively you placed, as you have described in answer to Int. No. 9, the second covering of thread and the second coat of paint upon the wire in order to perfect the insulation.

Ans. I did it as early as 1860, to the best of my remembrance.

12th Int. What kind of paint did you use?

Ans. I used white lead and I also used different kinds of paint.

(Signed) EDWIN HOLMES.

Subscribed and sworn to before me this 28th day of July, 1886.

J. D. REED,
Notary Public, Otsego Co., N. Y.

218 Circuit Court of the United States, District of Connecticut.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY COMPANY. } In Equity.

BOSTON, *Sept.* 16, 1886—10.30 a. m.

Testimony taken on the part of the defendants under rule 67 as amended by consent of counsel.

Present: Charles E. Mitchell, Esq., counsel for complainants, and Morris W. Seymour, Esq., counsel for the defendants.

CHARLES WILLIAMS, Jr., a witness being produced on the part of the defendants, being first duly cautioned and sworn to tell the truth, the whole truth, and nothing but the truth, in answer to the several interrogatories deposes and says:

1st Int. What is your name, age, residence, and occupation?

Ans. Charles Williams, Jr.; age, 56; a manufacturer of electrical instruments; residence, Somerville, Mass.

219 2d Int. How long have you been engaged in the manufacture and sale of electrical instruments and supplies?

Ans. Since 1856.

3d Int. Has it been a part of your electrical business to manufacture, use yourself, and sell to others wire insulated for electrical purposes?

Ans. It has.

4th Int. Do you know Mr. Edwin Holmes, of the Holmes Burglar Alarm Company, of New York; and, if so, have you ever sold him or his concern insulated wire?

Ans. I do, and have.

5th Int. Please describe the manner in which you insulated the wire which you thus sold to him.

Ans. The wire was first covered with cotton and afterwards run through glue. The glue was put in a tunnel with a cork in the end of it, and the wire passed through a hole in the cork and was wound onto a reel. As the wire was wound onto the reel it was passed through a cloth to take up the surplus glue and make the wire smooth. It was afterwards painted by hand with a brush.

6th Int. What substance did you use with which to paint this wire?

Ans. I used ordinary green paint, with quite a proportion of varnish to give it a smooth surface, and in some cases used white paint, composed of white lead, spirits, and varnish.

220 7th Int. Please fix a date anterior to which you are willing to swear positively you used green and white paint for purposes of insulation.

Ans. I used it previous to 1860.

8th Int. Please fix a date anterior to which you are positive that you sold and furnished Mr. Holmes, or the Holmes Burglar Alarm Co., the wire thus insulated.

Ans. I am positive that I sold it to him previous to 1863.

9th Int. Where was your manufacturing establishment located in 1860?

Ans. In 1860 it was located at what used to be 313 Washington St. They have changed the number since then.

10th Int. Were you at this time supplying other concerns with wire insulated in the manner you have described?

Ans. I was.

11th Int. Did you ever know of any of your customers using wire thus insulated for electric lighting purposes; and, if so, who so used it, where, and when?

Ans. Yes; Professor Moses G. Farmer used the wire in his electric light experiments in my factory, at 109 Court St., about the year 1867.

(Testimony as to Moses G. Farmer objected to for same reason as given in connection with Ans. No. 5, if corresponding claims be made.)

221 12th Int. Did Prof. Farmer work for you in your business, or did he carry on his business independently, hiring room of you?

Ans. He did not work for me. He was experimenting on his own account and had a room of me in my factory.

13th Int. Did you have access to his room, so that you could see what he was doing there?

Ans. I did.

14th Int. Did you ever see a light produced by him by the use of electricity?

Ans. I did.

15th Int. What was the character of that light?

Ans. It was an incandescent light, produced by heating a strip of platina.

16th Int. Do you know of his putting that light into practical use for the purposes of illumination?

Ans. I do.

17th Int. Where?

Ans. At his own house in Salem and at the house of Chauncey Smith, the patent lawyer, in Cambridge.

Cross-examination by Mr. MITCHELL:

18th X Int. For what purpose was the wire (previously wound) passed through glue in making the wire you have testified to?

222 Ans. It was for the purpose of making the cotton adhere together and better adhering to the wire, and it also gave the wire a smooth finish.

19th X Int. How far was the reel from the vessel that contained the glue?

Ans. Perhaps five or six feet.

20th X Int. How did you render the glue sufficiently dry to make the wire reel up properly?

Ans. The glue dried on the reel. The glue dried after the wire was wound on to the reel.

21st X Int. What prevented the coils or windings of the wire upon the reel from adhering together if they were wound before the glue was dry?

Ans. The reel being of large diameter and very wide, the wire was so wound on as to have each convolution separated.

22d X Int. How wide was the reel?

Ans. The reel was about three feet wide and it was eight or ten feet in diameter.

23d X Int. How many yards of wire would it hold, speaking approximately?

Ans. Well, from two to three hundred yards.

24th X Int. In what way did the cloth act to make the wire that had been passed through the glue smooth?

Ans. The usual practice was for one boy to hold a cloth on the wire as it came from the vessel containing the glue, and another person holding the wire with a cloth guided it onto the reel.

25th X Int. Why was it customary to have two operatives

223 between the glue vessel and the reel, and why were two cloths employed?

Ans. Because two persons could do it to a better advantage than one, although one person could do it.

26th X Int. Why could two persons do it to a better advantage than one?

Ans. Because one person could not very well attend to freeing the glue from the wire and at the same time wind it regularly on the reel.

27th X Int. Why could not one person very well attend to both the operations you have mentioned?

Ans. The person who holds the cloth nearest the vessel that contains the glue has to be very careful to wipe off the glue and squeeze the wire and make it smooth, which requires both hands to do it thoroughly.

28th X Int. Did the person with the second cloth do anything to the wire or to the finish of the wire as he guided it onto the reel?

Ans. The second person held the wire in a cloth in guiding it onto the reel more particularly that the glue should not stick to his hands; if there were any imperfections of course the second person smoothed it over.

29th X Int. How did you make the green paint of which you have spoken?

Ans. Took Paris green and mixed it with spirits of turpentine, and sometimes put in some oil.

30th X Int. In reply to question 6 you speak of the use
224 of "quite a proportion of varnish" along with the green paint. What proportion do you refer to?

Ans. Oh, I should say we used one-quarter of varnish.

31st X Int. Why did you use such poison as Paris green for the green paint?

Ans. Well, I used it because it was the paint in common use.

32d X Int. Well, do you know why Paris-green paint is in common use?

Ans. I do not know that I do, unless it was because of the cheapness of the substance.

33d X Int. Explain a little more fully the method of applying the paint by hand with a brush.

Ans. We put it on with an ordinary paint brush, first going over the wire on the outside of the reel and then going over the inside of the wire on the inside of the reel.

34th X Int. Do you mean that you first obtained what might be called a reel full of wire and then painted the wires as they lay side by side upon the reel the same as you would paint the side of a house?

Ans. The wire was put upon the reel in one layer, the convolutions were as near together as they could be placed without adhering together or to each other, and then we painted that layer as we would paint the side of a house.

35th X Int. How could you get at the interior face of the layer of wire upon the reel to paint it?

225 Ans. The reel was a skeleton reel, and you could readily reach in and paint on the inside.

36th X Int. But how about the places where the wire was in contact with those portions of the skeleton reel which supported the series of coils?

Ans. After putting on the first coats of paint, being dry, we shifted the wire so that the bare portions were exposed, and then they were painted.

37th X Int. Was not shifting the entire series of convolutions upon the reel so as to expose all the bare places that they might be painted too a somewhat tedious operation?

Ans. Not very; a person that understood it could do it very quick.

38th X Int. He had to shift each convolution in succession, did he not?

Ans. He did.

39th X Int. How many convolutions should you say there were upon the reel at the same time?

Ans. One hundred or one hundred and fifty convolutions.

40th X Int. What were the nature of the experiments that Moses G. Farmer was conducting in your factory in 1867?

Ans. His experiments were on perfecting the apparatus he used.

41st X Int. What apparatus?

Ans. Electric light apparatus.

226 42d X Int. Did Moses G. Farmer succeed in his experiments at the time you speak of?

Ans. He did. He succeeded in producing a very good incandescent light with a chemical battery.

43d X Int. Was the use of the incandescent light at his house or the house of Chauncey Smith by way of permanent use or was it by way of test or exhibition?

Ans. I do not think it was in permanent use. It was more of a test and exhibition.

44th X Int. The test was of a single light, I presume?

Ans. I can't say about that, but I presume that there were more than one light.

45th X Int. Are you speaking on what took place at Mr. Farmer's house and the house of Chauncey Smith from information or were you present at the test?

Ans. I am speaking from information only. I was not present.

46th X Int. Do you know what became of the attempts of Farmer at that time to produce an incandescent light with a chemical battery?

Ans. Will say that I do not.

47th X Int. Was the attempt given up as unsuccessful, as far as you know?

Ans. I think the attempt was given up on account of the expense of the use of the chemical battery.

48th X Int. For what purpose was the wire intended to be used that was furnished the Holmes Company?

Ans. For burglar alarms and house annunciators.

227 (Counsel for complainants objects to so much of the testimony as relates to the tests at Farmer's house and Chauncey Smith's as hearsay.)

(Signed) CHARLES WILLIAMS, JR.

BOSTON, *Sept.* 16*th.*

Subscribed and sworn to before me.

FRED. J. HUTCHINSON,
Notary Public and Special Examiner by Consent of Counsel.
[SEAL.]

NEW HAVEN, CONN., *Sept.* 23, 1886.

Met pursuant to adjournment.
Present: Counsel for the parties.

(Defendant's counsel offers in evidence four specimens of covered wire, marked Exhibit- Reed A, B, C, and D, and it is stipulated that the witness Reed, heretofore produced on the part of the defendants, will swear that since his former examination he has made the same in identically the same manner as he insulated wire in 1873 and 1874, as hereinbefore testified by him.)

(Defendants' counsel agrees that it is not claimed that the witness Reed used the No. 6 wire in 1873 and 1874.)

228 (It is further agreed that the witness shall be produced by defendants' counsel for cross-examination, upon request of complainants' counsel, any time within three months upon reasonable notice, at Mr. Earle's office, in New Haven, Conn., or at some other place, to be agreed upon, said witnesses to be presented as aforesaid, whether the complainants have commenced their testimony in reply or not.)

Defendants closed.
Attest: FRED. C. EARLE,
Notary Public.

September 23d, 1886.

229 NEW HAVEN, CONN., *Jan. 4th*, 1887.

Met pursuant to adjournment.
Present: Counsel for the parties.

THOMAS L. REED, a witness produced by the defendants for cross-examination as hereinbefore agreed.

Cross-examination by Mr. PUSEY:

X Q. 36. Please explain just how you made these Exhibits A, B, C, and D—in other words, what apparatus or mechanism did you use?

Ans. In July, 1886, at the request of Mr. Seymour, I went to the Bridgeport Brass Company and there proceeded to make these exhibits. I used an apparatus which operated in substantially the same way as that shown in the drawing called Exhibit "Reed Drawing," referred to in my previous testimony, with the exception that

I run the painted and braided wire, instead of through clamps, through a cloth held in my hand.

37th X Q. After you had applied the final coat of paint to Exhibit "A" and "C" how long was it before you applied the second braid and paint thereon to Exhibits "B" and "D"?

Ans. It must have been all done within four hours.

38th X Q. You speak in your previous testimony of having
230 mixed, in some instances, lime, aloes, and arsenic with the paint. State whether or not any of these Exhibits A, B, C, and D contain any of these ingredients.

Ans. They did not to my knowledge.

39th X Q. Can you say with certainty how the quality or the consistency of the paint used by you in making these exhibits compares with that used in making the wire in 1873 and 1874, as testified to by you in your previous testimony?

Ans. In answer to the same I should say that the paint was held or carried up to the wire until it got up to the threads to all appearances, as it did the last time I done the operation at E. P. Phillip's, Providence, in 1878.

40th X Q. Did you mix the paint to make these exhibits or did you find it already mixed?

Ans. I bought them already mixed from the drug store.

THOMAS L. REED.

Cross-examination closed.

Attest: FRED C. EARLE,
Notary Public.

231 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of the file-wrapper and contents in the matter of the letters patent granted Alfred A. Cowles, February 20, 1883, number 272,660, for improvement in insulated electric conductor.

In testimony whereof I, M. V. Montgomery, Commissioner of Patents, have caused the seal of the Patent Office to be af-
[L. S.] fixed this fifth day of February, in the year of our Lord one thousand eight hundred and eighty-six, and of the Independence of the United States the one hundred and tenth.

M. V. MONTGOMERY,
Commissioner.

232 To the Honorable Commissioner of Patents:

Your petitioner, Alfred A. Cowles, of the city and State of New York, prays that letters patent may be granted to him for the invention of an improvement in insulated electric conductors set forth in the annexed specification.

And further prays that you will recognize Lemuel W. Serrell, of the city of New York, N. Y., as his attorney, with full power of substitution and revocation, to prosecute this application, to make

alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

ALFRED A. COWLES.

New York, New York, Nov. 6, 1882.

233 (*Oath.*)

L. W. Serrell, N. Y.

UNITED STATES OF AMERICA, }
County of New York, State of New York. }

Alfred A. Cowles, the within-named applicant, a resident of the city and State of New York, who, being duly sworn, deposes and says that he is a citizen of the United States; that he verily believes himself to be the original, sole, and first inventor of the improvement in insulated electric conductors described and claimed in the specification hereunto annexed; that the same has not been patented to him or to others with his knowledge or consent in any country; that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application, and that he does not know and does not believe that the same was ever known or used prior to his invention thereof.

ALFRED A. COWLES.

Sworn to and subscribed before me this 6th day of November, 1882.

[NOTARY SEAL.] GEORGE T. PINCKNEY,
Notary Public, Kings Co.

234 To all whom it may concern:

Be it known that I, Alfred A. Cowles, of the city and State of New York, have invented an improvement in insulated electric conductors, of which the following is a specification.

Before my invention copper wires had been covered with one or two braidings of cords and paraffine, tar, asphalt, and various substances had been employed for rendering the covering water-proof and furnishing a proper insulation. With conductors of this character several accidents occurred in consequence of the conductor becoming heated and setting fire to the insulation.

For this reason objections were made to insuring buildings against loss by fire where electric lamp wires were introduced.

To render the conductor fire-proof without interfering with the insulation led me to invent and manufacture the insulated electric conductors to which the present invention relates, which conductors have gone extensively into use during about a year and a half before the date of this specification.

I manufacture the said fire-proof insulation of the conductor in the following manner, reference being had to the annexed drawing, which illustrates the devices employed:

235 The wire *a* is passed up through the head of a braiding machine and a layer of cotton or other threads is placed upon the wire in an ordinary manner. The braiding head with

spools is indicated at *b*. The covered wire now passes in at the bottom of the vessel *c* through a suitable packing, *d*. This vessel *c* contains paint, preferably white lead or white zinc ground in oil and mixed with a suitable dryer. The paint saturates the braided covering and the surplus runs down the same back into the vessel *c* as the braiding progresses. I next apply a second braiding directly upon the paint. For this purpose a second braiding-machine head is employed, the same being shown at *f*.

The threads that are braided upon the paint force the paint into the first braided covering and at the same time the paint oozes through between the threads; hence the paint is incorporated throughout the braided covering and fills up the pores.

The braided covering is rendered even and consolidated by suitable means, such as one or two pairs of grooved rollers, *k k*.

In practical use it is found that the covering is of the most reliable character. It is compact and hard. The wire is perfectly insulated and there is no possibility of inflaming the covering. With intense heat the threads may char but they will not burn. For these reasons this insulated conductor is preferred to those before made.

I remark that in the manufacture of this conductor it is preferable to reel the covered wire as it passes from the braiding and painting machine and then remove the reel from the coil and hang up such coil in a heated room until it is thoroughly hardened.

236

More than two layers of braiding may be employed, the paint intervening between the layers. Winding with threads or cords may take the place of braiding.

If desired, a coat of paint may be applied outside the outer layer of fibrous material, and this may be colored so as to be used in distinguishing the wires. It is always preferable to braid the second or subsequent coats upon the paint when fresh, but I do not limit myself in this particular, as the paint may be dried or partially so before the next layer of braiding is applied. Paint might be applied to the wire before the first braiding.

Insert A, Jan. 4, '83.

I claim as my invention:

Erased Jan. 4, '83. First. The method herein specified of insulating electric conductors and rendering them substantially fire-proof, consisting in two or more layers of fibrous material with interposed paint, substantially as set forth.

Second. The method herein specified of insulating electric conductors and rendering the coating non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets, substantially as set forth.

Substitute B, Jan. 4, '83. 237 Third. An insulated and non-combustible electric conductor composed of two or more layers of cotton or similar threads with intervening paint, substantially as set forth.

Signed by me this sixth day of November, A. D. 1882.

ALFRED A. COWLES.

Witnesses:
GEO. T. PINCKNEY.
WILLIAM G. MOTT.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Dec.* 18, 1882.

(Copied.)

Room No. 91.

A. A. Cowles, care Lemuel W. Serrell, box 260, N. Y. city;

76459. Insulated elect. conductors. Filed Nov. 10, 1882.

In this application claim 1 is obviously bad in form.

238 The claims are rejected on reference to Bishop Oct. 13, 1868, No. 83031 (conductors).

FREEMAN, *Ex.*

C. M. C.

NEW YORK, *Jan. 3rd*, 1883.

Hon. Commissioner of Patents.

SIR: In the matter of my application, No. 76459, filed November 10th, 1882, for a patent on insulated electric conductors, I amend the specification as follows:

By inserting the following at the end of paragraph 12:

"I am aware that wire has been covered with braided threads; also that India rubber, asphaltum, and similar materials have been applied upon the covering either hot or cold, but one coating of such material was allowed to set or harden before the next layer of braided material was applied; hence the asphaltum or similar material was not forced into the interstices; and, besides this, all these substances ignite
A. by the wire becoming heated or fire will follow along such covering.

"I have discovered that ordinary paint, composed of lead or zinc, with linseed oil, is practically non-combustible, and it prevents the covering being ignited by the wire becoming hot if there is a resistance to the electric current; besides this fire will not burn along the conductor, as is the case where the fibrous covering is saturated with asphaltum, India rubber, or similar material."

239 By erasing claim 1.

By erasing claim 3 and substituting the following:

"Third. An insulated and non-combustible covering for electric conductor, composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers and fills the interstices of the covering, substantially as set forth."

Respectfully yours, ALFRED A. COWLES,
Per LEMUEL W. SERRELL, *Att'y.*

(2-024.)

Issue division. Serial No. 76459.

All communications should be addressed,
"The Commissioner of Patents,
Washington, D. C."

DEPARTMENT OF THE INTERIOR,
U. S. PATENT OFFICE,
WASHINGTON, D. C., *Jan.* 31, 1883.

Alfred A. Cowles, care Lemuel W. Serrell, box 260, N. Y. city.

SIR: Your application for a patent for an improve-
240 ment in insulated electric conductors, filed Nov. 10, 1882, has been examined and allowed.

The final fee, twenty dollars, must be paid, and the letters patent bear date as of a day not later than six months from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least twenty days prior to the conclusion of six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, distinctly and plainly written, the name of the inventor and title of invention as above given, date of allowance (which is the date of this circular), date of filing, and, if assigned, the names of the assignees.

If you desire to have the patent issue to assignees, an assign-
241 ment containing a request to that effect, together with the fee for recording the same, must be filed in this

The within title is that given by the examiner in charge as most appropriate to your invention. Should you desire a change in the same, satisfactory reason must be given therefor on or before the payment of the final fee.

office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be charged for at the following rates: Single copies, uncertified, 25 cents; twenty copies or more, 10 cents each. The money should accompany the order.

Very respectfully,

E. M. MARBLE,
Commissioner of Patents.

FEB. 1ST, 1883.

☞ In remitting the final fee give the serial number at the head of this notice.

Dated New York.

To Comm'r Patents:

Please place Alfred A. Cowles' two patents for conductors in issue to-day.

Check by mail.

L. W. SERRELL.

This fee was ordered paid by telegraph Feb'y 1, 1883.

242

Memorandum
of
fee paid at U. S. Patent Office.
Serial No. 76459. 1882.
Inventor:
Alfred A. Cowles.
Patent to be issued
to
Alfred A. Cowles.
Name of invention as allowed:
Insulated electric
conductors.
Date of payment:
Feb'y 1, 1883.
Fee:
$20.00.
Solicitor:
Lemuel W. Serrell.
Date of circular of allowance:
Jan'y 31, 1883.
Send patent to
Lemuel W. Serrell,
140 Nassau St.,
New York. P. O. box 260.

243 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *March* 17, 1885.

(Copied.)

Room No. 91.

A. A. Cowles, care Lemuel W. Serrell, box 260, N. Y. city:

Please find below a copy of a communication from the examiner concerning your patent No. 272,660, Feb. 20, 1883, insulated electric conductor.

Very respectfully, R. G. DYENFORTH,
Commissioner of Patents.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the rules.

The statement demanded by rule 105 must be sealed up and filed on or before the 30th day of April, 1885, with the subject of the invention and name of party filing it indorsed on the envelope. The subject-matter involved in the interference is a conductor having applied to its surface an insulating covering of fibrous material impregnated with a liquid fire-proofing material, consisting of a
244 metallic oxide or oxides, and a binding material, the impregnated fibrous material forming the insulating covering.

Patentee's claim 2 and claim 1 of appl'n of Thomas Egleston (of New York); attorneys, Brown & Hall, 262 Broadway, N. Y.

C. J. KINTNER, *Examiner.*

Serial No. $\frac{764}{112}\frac{59}{}$ Ex'r Book No. —.

1882. Freeman.

Patent No. 272,660.
Alfred A. Cowles,
Of New York,
County of " "
State of " "
Invention, insulated electric conductors.
Petition, Nov. 10, 1882.
Affidavit, " " "
Specification, " " "
Drawing, " " "
Model, not required.
Specimen, —.
First fee, cash, $15, Nov. 10, 1882.
" " cert., —.
App. filed complete Nov. 10, 1882.
Examined Jan. 30, '83. Freeman.
245 Countersigned: J. M. Babson,
Jan. 31, '83. For Commissioner.
2. Notice of allowance, Jan. 31, 1883.

Final fee, cash, $20, Feb. 1, 1883.
" " cert., —— —, 188–.
3. Patented Feb. 20, 1883.
Att'y or P. O. address:
Lemuel W. Serrell, box 260, New York city.

1882.

Contents.

Application papers.
1. Dec. 18, 1882, rejected.
2. Jan. 4, '83, am'd't A. B.
3. March 17, '85, X Egleston.
4. Nov. 19, '85, dec'd fav. of Cowles.
5.
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9.
10.
11.
12. 36 electricity
13. Conductors
15.

18

246 13.
16.
17.
18. Conductors.
19.
20.

Title: Improvement in insulated electric conductors.

UNITED STATES PATENT OFFICE.

ALFRED A. COWLES, of New York, N. Y.

Insulated Electric Conductor.

Specification forming part of Letters Patent No. 272,660, dated February 20, 1883; application filed November 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, Alfred A. Cowles, of the city and State of New York, have invented an improvement in insulated electric conductors, of which the following is a specification:

247 Before my invention copper wires had been covered with one or two braidings of cords, and paraffine, tar, asphalt, and various substances had been employed for rendering the covering water-proof and furnishing a proper insulation. With conductors of this character several accidents occurred in consequence of the

conductor becoming heated and setting fire to the insulation. For this reason objections were made to insuring buildings against loss by fire where electric lamp wires were introduced. To render the conductor fire-proof without interfering with the insulation led me to invent and manufacture the insulated electric conductors to which the present invention relates, which conductors have gone extensively into use during about a year and a half before the date of this specification.

I manufacture the said fire-proof insulation of the conductor in the following manner, reference being had to the annexed drawing, which illustrates the devices employed: The wire at *a* is passed up through the head of a braiding machine, and a layer of cotton or other threads is placed upon the wire in the ordinary manner. The braiding head, with spools, is indicated at *b*. The covered wire now passes in at the bottom of the vessel *c*, through a suitable packing, *d*. This vessel *c* contains paint, preferably white lead or white zinc ground in oil and mixed with a suitable drier.

The paint saturates the braided covering and the sur-
248 & 249 plus runs down the same back into the vessel *c* as the braiding progresses. I next apply a second braiding directly upon the paint. For this purpose a second braiding machine head is employed, the same being shown at *f*. The threads that are braided upon the paint force the paint into the first braided covering and at the same time the paint oozes through between the threads. Hence the paint is incorporated throughout the braided covering and fills up the pores. The braided covering is rendered even and consolidated by suitable means, such as one or two pairs of grooved rollers, *k k*.

In practical use it is found that the covering is of the most reliable character, it is compact and hard, the wire is perfectly insulated, and there is no possibility of inflaming the covering. With intense heat the threads may char, but they will not burn. For these reasons this insulated conductor is preferred to those before made.

I remark that in the manufacture of this conductor it is preferable to reel the covered wire as it passes from the braiding and painting machine and then remove the reel from the coil and hang up such coil in a heated room until it is thoroughly hardened.

More than two layers of braiding may be employed, the paint intervening between layers. Winding with threads or cords may take the place of braiding.

If desired, a coat of paint may be applied outside the outer
250 layer of fibrous material, and this may be colored, so as to be used in distinguishing the wires. It is always preferable to braid the second or subsequent coats upon the paint when fresh, but I do not limit myself in *in* this particular, as the paint may be dried, or partially so, before the next layer of braiding is applied. Paints might be applied to the wire before the first braiding.

I am aware that wire has been covered with braided threads; also that asphaltum and similar material have been applied upon the covering either hot or cold, but one coating of such material was

allowed to set or harden before the next layer of braided material was applied. Hence the asphaltum or similar material was not forced into the interstices, and besides this all these substances ignite by the wire becoming heated, or fire will follow along upon such covering.

I have discovered that ordinary paint composed of lead or zinc with linseed oil is practically non-combustible, and it prevents the covering being ignited by the wire becoming hot if there is a resistance to the electric current; besides this, fire will not burn along the conductor, as is the case where the fibrous covering is saturated with asphaltum, India rubber, or similar material.

I claim as my invention—

1. The method herein specified of insulating electric conductors and rendering the coating substantially non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and
251 a second layer of fibrous material upon the paint before it dries or sets, substantially as set forth.

2. An insulated and non-combustible covering for electric conductors, composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers and fills the interstices of the covering, substantially as set forth.

Signed by me this 6th day of November, A. D. 1882.

ALFRED A. COWLES.

Witnesses:

GEO. T. PINCKNEY.
WILLIAM G. MOTT.

And at the term of said court held at New Haven, on the 4th Tuesday of April, 1887, the complainants, by Messrs. Wooster, Torrance & Gager, their attorneys, duly appeared to prosecute said suit, and the defendants, by Messrs. Seymour & Seymour, their attorneys, also appeared, and said cause was fully heard; and on the 3rd day of September, 1887, the court filed its opinion, in the words and figures following, viz:

252 Circuit Court of the United States for the District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY }
vs.
THE ELECTRICAL SUPPLY COMPANY. }

SHIPMAN, *J.:*

This is a bill in equity based upon the admitted infringement of letters patent No. 272,660, granted to Alfred A. Cowles, February 20th, 1883, for an improvement in insulated electric conductors.

The patentee's view of the state of the art at the date of the invention and of the character and scope of the patented improvement is given in the specification of the patent, which I quote at length, as follows:

"Before my invention copper wires had been covered with one or two braidings of cords, and paraffine, tar, asphalt, and various substances had been employed for rendering the covering water-proof

and furnishing a proper insulation. With conductors of this character several accidents occurred in consequence of the conductor becoming heated and setting fire to the insulation. For this reason objections were made to insuring buildings against loss by fire where electric lamp wires were introduced. To render the conductor fire-proof without interfering with the insulation led me to invent and manufacture the insulated electric conductors to which the present invention related, which conductors have gone extensively into use during about a year and a half before the date of this specification.

253 I manufacture the said fire-proof insulation of the conductor in the following manner, reference being had to the annexed drawing, which illustrates the devices employed: The wire *a* is passed up through the head of a braiding machine, and a layer of cotton or other threads is placed upon the wire in the ordinary manner. The braiding head, with spools, is indicated at *b*. The covered wire now passes in at the bottom of the vessel *c*, through a suitable packing, *d*. This vessel, *c*, contains paint, preferably white lead or white zinc ground in oil and mixed with a suitable drier. The paint saturates the braided covering and the surplus runs down the same back into the vessel *c*, as the braiding progresses. I next apply a second braiding directly upon the paint. For this purpose a second braiding-machine head is employed, the same being shown at *f*. The threads that are braided upon the paint force the paint into the first braided covering and at the same time the paint oozes through between the threads. Hence the paint is incorporated throughout the braided covering and fills up the pores. The braided covering is rendered even and consolidated by suitable means, such as one or two pairs of grooved rollers, *k k*.

In practical use it is found that the covering is of the most reliable character, it is compact and hard, the wire is perfectly insulated, and there is no possibility of inflaming the covering. With intense heat the threads may char, but they will not burn. For these reasons this insulated conductor is preferred to those before made.

254 I remark that in the manufacture of this conductor it is preferable to reel the covered wire as it passes from the braiding and painting machine, and then remov- the reel from the coil and hang up such coil in a heated room until it is thoroughly hardened.

More than two layers of braiding may be employed, the paint intervening between the layers. Winding with threads or cords may take the place of braiding.

If desired, a coat of paint may be applied outside the outer layer of fibrous material, and this may be colored so as to be used in distinguishing the wires. It is always preferable to braid the second or subsequents coats upon the paint when fresh; but I do not limit myself in this particular, as the paint may be dried or partially so before the next layer of braiding is applied. Paint may be applied to the wire before the first braiding.

I am aware that wire has been covered with braided threads;

also that India rubber, asphaltum, and similar materials have been applied upon the covering either hot or cold; but one coating of such material was allowed to set or harden before the next layer of braided material was applied.

Hence the asphaltum or similar material was not forced into the interstices, and besides this all these substances ignite by the wire becoming heated or fire will follow along upon such covering.

I have discovered that ordinary paint composed of lead or zinc, with linseed oil, is practically non-combustible, and it prevents the covering being ignited by the wire becoming hot if there is a
255 resistance to the electric current; besides this, fire will not burn along the conductor, as is the case where the fibrous covering is saturated with asphaltum, India rubber, or similar material.

The claims of the patent are as follows:

"1. The method herein specified of insulating electric conductors and rendering the coating substantially non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets, substantially as set forth.

2. An insulated and non-combustible covering for electric conductors, composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers and fills the interstices of the covering, substantially as set forth."

The patentee's statement that after one coating of heated material, like India rubber or asphaltum, had been applied upon the first layer of braided covering of the wire such coating was allowed to set or harden before the next layer of braided material was applied is true, but it is not true that it was always so allowed to harden. The second layer of braided covering was often added to the wire while the first coating of water-proof material was in a wet or plastic condition.

Prior to the introduction of electric lamp lights into buildings a principal object in the insulation of electric wires was their thorough protection against the effect of water or wet air, and therefore such substances as paraffine, gutta-percha, and India rubber were abundantly used to saturate the fibrous covering of the wire. The
256 expert of the plaintiff sums up the state of the art at this date by saying, "It was old to make use of a fibrous covering to the metallic wire and it was old to saturate that covering with water-proof materials, such, for instance, as paraffine, pitch, tar, resin in a melted condition, and also gutta-percha and India rubber in a solution, and, in some instances, even paint had been made use of."

These substances had been used to insulate the conductor electrically, so that the current passing along the wire might not escape by contact of the covering with the support or with any conducting substances. He further truly says, in relation to the numerous English patents which are in the record, that paint had been used "in connection with electric conductors as a protection for an interior water-proofing coating of combustible material, in which

case the paint formed or became part of an armor for the electric insulating material. I do not find any instance where the electric conductor itself was insulated and the coating of fibrous material rendered substantially non-combustible by paint laid in between the two layers of fibrous material, so that the particles of oxides or carbonates are pressed and bound into the fibres so as to fill the interstices thereof, as set forth in complainant's patent and secured by the claims thereof."

These patents were generally for land or submarine telegraph cables. The wires which were generally introduced into dwellings or buildings were small wires for conducting an electric current of low tension, such as were necessary for annunciators or for
257 burglar alarms, and after the discovery of the useful properties of paraffine that article was almost universally used in this country to saturate the fibrous coverings of inside electric wires.

When buildings began to be lighted by means of electric lamps and it became necessary that wires for inside use should convey currents of high tension, the use of wires covered with inflammable non-conductors became dangerous. If, from any cause, the passage of the current was checked and the wires became overheated, the inflammable covering melted or took fire and endangered the safety of the building. The use of paraffine-covered wires inside buildings was forbidden by the board of fire underwriters in the city of New York. To guard against this danger the patentee produced his patented conductor. The covering was not merely an insulator, but was a non-combustible insulator. It is a success, has superceded the use of paraffine-covered wire, and is universally used for inside wiring for electric lamps.

The English patents, a large number of which were introduced, are not an anticipation; they are all simply for electrical insulation and are expedients to guard against the dangers from water and not from fire. Where any of them use paint such use is in connection with inflammable materials and is simply as a protection for the water-proof covering. Neither was it shown that before the date of the invention, which was in the spring of 1881, paint had been knowingly used, except experimentally, to make a non-combustible insulator. The defence based upon the English patents and upon the known use of paint as a non-combustible material for covering electric wires must fail.

258 The most important testimony which was offered by the defendant was that of Edwin Holmes, the president of the Holmes Burglar Alarm Telegraph Company, who had been engaged in that business for twenty-five years and had thereby become familiar with the methods of the manufacture of electric wires. He testified as follows:

"3d Int. In your business has it been necessary for you to use insulated electric conductors? And, if so, please describe the manner in which those conductors were insulated, beginning back as early as you remember.

"Ans. It has; when I first commenced using them the wire was

insulated by winding a thread larger or smaller, as the case might be, around the wire, and that thread was covered with paint; all of my wire was insulated in that way until paraffine was substituted for the paint.

"3rd Int. How was the paint applied?

"Ans. I think at first it was applied with a brush; I applied it by drawing it through a vessel containing paint and then through a piece of thick rubber or gutta-percha which removed the surplus paint and left a smooth surface on the thread which covered the wire."

9th Int. In your business did it ever become necessary to secure as perfect insulation of wire as possible; and, if so, what method did you take of accomplishing that result? In answering this question please confine your answer to the use of fibrous material and paint.

Ans. It did; I accomplished it sometimes by covering the
259 wire with a thicker thread and two coats or more of paint, sometimes by a thread covering and a coat of paint, then another thread covering and a coat of paint on that.

10th Int. Was that second fibrous covering and second coat of paint placed upon the first covering and paint while it, the first covering of paint, was in an "undry" or "unset" condition?

(Complainants' counsel objects because the question is leading and suggestive. Question withdrawn and the following interrogatory substituted therefor:)

10th Int. Please describe the condition of the first coating of paint when the second coating of fibrous material and paint was put upon it?

Ans. The first coat was partially dried so as to keep its place, but would admit of an impression from the next covering of thread.

11th Int. Please state a date anterior to which you are willing to swear positively you placed, as you have described in answer to Int. No. 9, the second covering of thread and the second coat of paint upon the wire in order to perfect the insulation?

Ans. I did it as early as 1860, to the best of my remembrance.

I cannot doubt that Mr. Holmes used wire covered with a double coat of thread, each layer being painted and the second layer being applied before the first painted layer had become dry. It will be observed that the method of painting was not the method of the patent and that the object was not to make the insulation fire-proof, because he abandoned the painted wire for paraffine wire.
260 The object of the double coat was to produce perfect insulation.

In the spring of 1881, when the necessity had arrived for a non-combustible insulator, Mr. Cowles used, first, a double-coated outside painted wire, but finding that the insulation was not perfect, next employed the process of recoating a coated and painted wire while the paint was still fresh.

The question is whether that process was patentable; whether, when it was old to cover an electric wire with a double layer of thread, each layar painted, the second layer being placed upon an

undried first layer for the purpose of thoroughly insulating the wire, it was patentable to braid or wind the second layer upon a freshly painted layer for the purpose of filling the interstices of the layers with a mass of paint and thereby making the covering a non-combustible insulator.

At the date of the invention the public had had an electric wire insulated by means of a double covering of painted thread, but the public did not know that such a covering was also non-combustible. Although it did not know it, it had had a non-combustible insulator, for I cannot doubt that Holmes' double covering was non-combustible in the same sense in which Cowles uses the term. The thread covering of the Holmes wire was loaded with paint.

It may be said that two facts are assumed without adequate proof: one, that Holmes used the double-covered and painted wire at all, and, next, that it was non-combustible.

In reply to such a suggestion it is manifest that the Holmes wire, either single or double covered, was one that would naturally
261 be used in a business which required single wires, and that in the multiform methods of insulation his method was an obvious and simple one, as is shown by the manner in which covering composed of braided and saturated thread were subsequently made. A less amount of evidence is required to satisfy the mind of so probable a fact than would be required in regard to a fact in its nature quite improbable. It is also true that Mr. Holmes' means of knowledge in regard to the manner of constructing his wires were exceptionally good.

In regard to the non-combustibility of the Holmes wire I have no idea that the Cowles process is the only one which can make by means of paint a braided or wound-thread covering non-combustible. The only requisite is to fill the interstices and pores of the thread with metallic paint. That the Holmes process upon the wires which he used was adequate for the purpose seems to me quite evident.

If Cowles had made his insulated covering in precisely the same manner that Holmes did it could not have been successfully claimed that the fact that Cowles had discovered what neither Holmes nor the public knew, viz., that the Holmes covering was non-combustible, made the Cowles covering patentable. The public already had the article in use as a covering of an electric wire for purposes of insulation, and also had in the article the additional benefit of non-combustibility. The case is not that of Colgate *v.* Western Union Telegraph Co. (15 Blatch. C. C. R., 365), in which the patentee first applied to practical use his discovery that gutta-percha was
262 a non-conductor of electricity. It was not shown that gutta-percha had ever been used to cover an electric wire, though metallic wires which were used for other purposes had been covered with it. The case rested upon the fact that the inventor first used gutta-percha as an insulator of electric wire.

The question then arises, Was the change in the method or process a patentable one? Holmes wound the wire, then painted, then wound again and repainted. Cowles wound, subjected the

wound wire to a bath of paint, then wound upon the freshly painted coat. Any one of the various old methods by which the covering is compelled to absorb a quantity of paint could be selected. The one which Cowles adopted is one which had been known in the analogous process of insulating telegraphic cables and electric wires and was familiar to the skilled mechanic in the art of manufacturing electric cables. I see in the adoption of this method only a skilful selection of one of a number of methods at the hand of the patentee and neither the creation of a new method nor the exercise of any inventive genius in the selection.

The conclusion is that Mr. Cowles met the need of the public by furnishing to it a safe and economical non-combustible covering for electric wires, but that the history of the article is such that he cannot be called an inventor within the meaning of the statutes upon the subject of patents.

The bill is dismissed.

Joshua Pusey and Charles E. Mitchell, for the plaintiff; M. W. Seymour and Benj. F. Thurston, for the defendant.

263 And on the 11th day of October, 1887, petition for rehearing on the record was filed in the words and figures following, viz:

Circuit Court of the United States, District of Connecticut. In Equity.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY. } No. 455.

Petition for Rehearing.

To the Hon. N. Shipman, one of the judges of said court:

The petition of The Ansonia Brass & Copper Company, complainant in this cause, humbly showeth—

That in the opinion heretofore filed in this case by your honor directing a decree dismissing the bill of complaint it was held that the invention of A. A. Cowles, upon which said suit was brought, to wit, letters patent No. 272,600, dated February 20, 1883, was anticipated or invalidated by what was done by one Edwin Holmes, as testified to by him in said cause.

That your petitioner is advised that said decision and order was erroneous in so far as it relates to what was done by said Holmes, in that, as your petitioner humbly submits, it does not apply to the determination of said cause, so far as relates to what was done by said Holmes, the rule sanctioned by the Supreme Court of the United States in Cantrell *vs.* Wallick, 117 U. S., 689, requiring proof beyond all reasonable doubt of one who sets up prior use and want of novelty.

Your petitioner therefore prays that said cause may be re-
264 heard before your honor upon the present record of pleadings and proof before the passing of final decree, and that said

order may be reversed and such other relief be granted as may be according to equity.

And your petitioner will ever pray.

JOSHUA PUSEY,
CHAS. E. MITCHELL,
Of Counsel.

Due service hereof is hereby accepted.

MORRIS W. SEYMOUR.

And on the same day petition for rehearing on affidavits was filed in the words and figures following, viz:

265 Circuit Court of the United States, District of Connecticut.
In Equity.

THE ANSONIA BRASS & COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY. } No. 455.

Petition for a Rehearing.

To the Honorable N. Shipman, one of the judges of said court:

The petition of the Ansonia Brass & Copper Company humbly showeth—

1. That your petitioner is complainant in the suit above named against the Electrical Supply Company for the infringement of letters patent No. 272,660, dated February 20, 1883, to Alfred A. Cowles for improvements in electric conductors, in which suit an order has been granted by your honor directing a decree for the defendant, which decree has not yet been passed.

2. That since the hearing in said cause and since the filing of the order directing such decree the complainant has been informed of the facts relating to what was done by Edwin Holmes before the invention of said conductor by said Cowles, which are set forth in the affidavits of John Latham and Edwin T. Greenfield and Edwin Holmes, appended to and made part hereof.

3. That your petitioner believes that the facts set forth in said affidavits are true, and your petitioner further says that it is
266 advised that said testimony has an important bearing upon said case, and that if the facts are as set forth in said affidavits and as your petitioner believes them to be your petitioner is entitled to a reversal of said order.

4. That said facts were unknown to your petitioner and its officers and managers (excepting so far as they may be held to agree with the testimony of Edwin Holmes taken by the defendant in said cause) when said former hearing was had and said decision made by your honor, although your petitioner was well satisfied that said Edwin Holmes never made any conductor wire like that patented to Cowles, because your petitioner fully believed that it was not possible for him to have done so without the fact coming to the knowledge of some of the managers or officers of the complainant.

5. That your petitioner and its officers and managers used due diligence to ascertain what was done by said Holmes by looking for

witnesses who could contradict or corroborate said Holmes, as the facts should be, and by looking for persons who could put your petitioner upon the track of such witnesses, but without avail; and your petitioner believes that such failure was owing to the long time which had elapsed since any wire was made by said Holmes in which paint was employed in any way for any purpose.

6. Since the opinion was filed in this case the secretary of the petitioner was called upon unexpectedly by the witness Greenfield, whose object in calling was in no way related to this case or to any of the matters connected with this case; that in conversation with said Greenfield it was casually learned that he was assistant superintendent of the Edison Wiring Company, and that he had
267 formerly been in the employ of said Edwin Holmes; that thereupon, on inquiry, the facts set forth in the affidavits of said Greenfield were ascertained, and said Greenfield agreed to testify to the same whenever he should be called upon to do so; that in said conversation said Greenfield informed said secretary of said Latham and of his connection with said manufacture by said Holmes; that said interview was wholly unexpected to said secretary, and that the knowledge acquired thereby was by the merest accident; that thereupon your petitioner set about establishing the facts that could be testified to by the witnesses respectively; and all of said affidavits are appended hereto and made a part of this petition.

Your petitioner further says that the efforts put forth to obtain testimony relating to the Holmes wire when the petitioner was preparing its testimony prior to the hearing were made out of abundant caution, because the petitioner was always advised by counsel that the wire testified to by said Holmes was not the same wire nor made in the same way as that patented to said Cowles, even supposing said testimony to be true.

Wherefore and by reason of the facts set forth herein and in said affidavits the complainant prays that said order may be reversed and a rehearing granted and an opportunity be given for taking the testimony of the witnesses aforesaid and such other testimony as may relate to the manufacture of electric conductors by said Edwin Holmes; and that such other relief may be granted as pertains to equity.

THE ANSONIA BRASS & COPPER CO.,
By ALFRED A. COWLES, *Secretary.*

268 STATE OF NEW YORK, }
City and County of New York, } *ss.:*

Subscribed and sworn to by A. A. Cowles, secretary of the petitioner, before me this 7th day of October, A. D. 1887.

ALFRED A. COWLES, *Secretary.*

THOMAS S. WALLING,
[SEAL.] *Notary Public* (184), *N. Y. Co.*

C. E. MITCHELL,
JOSHUA PUSEY,
Of Counsel.

269 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER CO. vs. THE ELECTRICAL SUPPLY CO. } In Equity.

STATE OF NEW YORK, *County of New York.* }

John Latham, being duly sworn according to law, deposes and says: I am sixty-one years old, and reside at No. 341 Prospect avenue, Brooklyn, New York. I am in the employ of the Holmes Burglar Alarm Telegraph Company, whose office is at No. 518 Broadway, New York, and have been in the service of said company since it was formed. My duty is to attend to the putting in of burglar alarms in buildings. Previously I was in the employ of Edwin Holmes, who is now the treasurer of the said company and was its predecessor in the burglar alarm telegraph business. My employment with Mr. Holmes commenced in or about the year 1861, and I have remained continuously in his service and that of his successor, the said Holmes Burglar Alarm Telegraph Company, since that time. I am entirely familiar with the wires for burglar alarms and annunciators made and used by Mr. Holmes and the methods used by him in making the same. I assisted in the making of said wires so far as concerned the painting of the same. Said wires were insulated with thread and paint in two ways; one (which was the usual method) was by winding two successive layers of thread upon the metallic wire and then applying a coat of green-colored paint on the outer layer; the other, by applying the
270 paint to the once thread-covered wire, then wiping off the surplus paint, and, after the remaining paint had become set and dry, then winding a second layer upon the painted surface. The paint was applied by putting a coil or quantity of the thread-covered wire into a tub of paint, then passing the wire up through a clamp or wiper, which I think was a piece of rubber, which removed the surplus. The wire was then passed onto and wound upon a large reel, some six or eight feet in diameter and several feet in width, in a manner to keep the turns of the wire out of contact with one another. As Mr. Holmes did not have apparatus for winding on the layers of thread, this was done at a factory in Brooklyn, by a person whose name was Carpenter—James Carpenter, I believe. The painting of the wire was done at Mr. Holmes' place in New York, so that when the first thread layer was painted and the paint dry it had to be sent to the Brooklyn factory to have the second covering of thread put on. The time that elapsed between the painting and the application of the second or outer thread covering or delivery of the painted wire to the Brooklyn factory was several days, depending upon the time required for the paint to dry, so that it could be suitably handled for applying the second thread covering.

Mr. Holmes' object in using the paint was to protect the thread and to secure additional electrical insulation. None of the said wire

made by him that I painted or that I ever saw or knew of was non-combustible, and it was not adapted for use for electric light conductors wherein it is necessa-y or desirable to have conductors that shall be proof against inflaming under the great heat apt to
271 be generated, and thus set fire to wood-work or other inflammable material in contact with the conductor. I understand the construction and mode of covering and insulating the wire described in the Cowles patent No. 272,660 of February 20th, 1883, and I am satisfied that wires such as made according to the methods used by Mr. Holmes as hereinbefore described could not practically serve the purposes of the patented Cowles wire for electric lighting neither as regards sufficiency of electrical insulation or as to fire-proof quality, for Mr. Holmes' wire was not fire-proof for the reason that the loading or charging of the interstices of the thread coverings or either of them with the paint was not accomplished by the methods employed by Mr. Holmes, but which is done by the Cowles method described in his said patent. Mr. Holmes made use of the said painted wire for a comparatively short time after I entered his employ, how long I do not now clearly recollect, when he abandoned it for wire wound with thread and saturated with paraffine.

I have no interest whatever in the above-entitled suit, and, in fact, I never heard of or knew of it until informed of it on the 27th day of September, 1887, when I was first called upon by counsel, who stated that he represented the Ansonia Brass & Copper Company, and requested me to state what I knew about the manufacture and use by Mr. Holmes of burglar-alarm wires.

JOHN LATHAM.

Sworn to and subscribed before me this 28th day of September, A. D. 1887.

[SEAL.] GEO. T. PINCKNEY,
Notary Public, Kings Co.

Certif. filed in N. Y. Co.

272 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER CO. }
vs. } In Equity.
THE ELECTRICAL SUPPLY CO. }

STATE OF NEW YORK, }
County of New York, } *ss:*

EDWIN T. GREENFIELD, being duly sworn according to law, deposes and says: I am forty-seven years old and reside at No. 92 East 10th street, New York city, and am at present engaged with the Edison Wiring Co., No. 12 East 17th street, New York city, in the capacity of assistant superintendent. In the spring of 1870 I entered the employ of Edwin Holmes, who is now treasurer of the Holmes Burglar Alarm Telegraph Co., and remained in Mr. Holmes' employ until the month of January, 1879. I am familiar with the burglar alarm and electrical annunciator wires made by said Edwin Holmes and the processes of manufacturing the same. Said wire was made

by first covering the same with two layers of thread and a coating of paint upon the outer layer of thread, and to some extent also by painting the once thread-covered wire, and then, after removing the surplus paint, allowing the paint to dry and set, then putting on a second layer of threads, both layers of thread being wound. The winding of the first layer of thread was done in one factory. It was then returned to Mr. Holmes, who applied the paint and removed the surplus by wiping it off; then after the paint remaining on the wire was dried and set it was returned to the other factory, and there the second coating of thread was applied. The time
273 that elapsed between the painting and the putting on of the second layer of thread was usually several days, but always the paint was set before the second layer of thread was put on; in fact, it had to be set, otherwise it could not be conveniently handled and manipulated.

These methods were used by Mr. Holmes for five or six years, until he began to use the paraffine coated wire, which he continued to use in place of the painted wire during the remainder of the time that I was with him.

Whilst in Mr. Holmes' employ I had occasion to frequently repair burglar-alarm wires made by him, and in this way became familiar with the painted wires made by him before I engaged with him. These wires were covered with paint in the same way I have hereinbefore described as to the wires made by him whilst I was in his employ.

I have carefully read and believe that I fully understand the same—Cowles patent No. 272,660, dated February 20th, 1883, and am familiar with the electric-light wire made according to said patent and its practical use, the said company, in whose employ I am, having used large quantities of the Cowles patented wire. In the Cowles wire the interstices of both the first and second coverings of thread are loaded with a great body of paint, which was not the case with the wire made by Mr. Holmes. The latter was quite inflam-able, for the reason that the oil was soaked up by the thread of the first layer, the paint was not forced into the interstices of the thread, and the amount of paint was comparatively so little that practically this wire was quite as inflam-able as the paraffined wire, and was more inflam-able after the paint was applied than before.

274 From my practical familiarity with both the wires made by Mr. Holmes and that made according to the Cowles patent I am enabled to say and do say that none of the Holmes wire that I ever saw him make or knew him to make was adapted for electric-lighting conductors, wherein it is necessary or desirable to have a non-combustible or non-inflam-able wire.

To the best of my knowledge and belief neither Mr. Cowles nor his counsel were aware of the facts hereinbefore stated as to my knowledge of the manufacture of the Holmes wire until the 26th day of September, 1887, when I, E. T. G., called at Mr. Cowles' office on a business matter, when the subject of electric-light wires was casually mentioned and I then informed Mr. Cowles of my

knowledge of and connection with the manufacture of the Holmes wire.

I have no interest whatever in this suit and the result thereof.

EDWIN T. GREENFIELD.

Sworn to and subscribed before me this 27th day of September, 1887.

G. M. BELDEN,
[SEAL.] *Notary Public, Kings County, N. Y.*

Certificate filed in New York county.

Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY. } In Equity.

COUNTY OF NEW YORK, *State of New York*, } *ss:*

EDWIN T. GREENFIELD, being duly sworn, deposes and says:

275 I am the same person who made an affidavit in the above-entitled cause on the 27th day of September, 1887.

On the 27th day of September, 1887, after making said affidavit, I obtained the piece of burglar-alarm wire hereunto attached from Noll Brothers, No. 12 East 17th street, New York. Said wire is part of a Holmes burglar-alarm apparatus, which was put in the residence of Charles Lanier, No. 30 East 37th street, New York city, which apparatus was put in Mr. Lanier's house in or about the year 1872, by Edwin Holmes, now treasurer of the Holmes Burglar Alarm Telegraph Company. Said apparatus was taken out by Noll Brothers in the year 1886.

I recognize the said piece of wire hereunto annexed as painted wire such as was made by said Edwin Holmes whilst I was in his employ from the spring of 1870 to January, 1879, as stated in my said affidavit of September 27th, 1887. It is identical with the painted wires that Mr. Holmes made previous to the time I entered his employ, and such as I had often seen and observed whilst repairing burglar alarms made by him before I entered said employ. Said piece of wire is in substantially the same condition as when it was first put in.

EDWIN T. GREENFIELD.

Sworn to and subscribed before me this 3rd day of October, A. D. 1887.

[SEAL.] THORNE S. WALLING,
Notary Public (184), *N. Y. Co.*

Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

276 EDWIN HOLMES, being duly sworn according to law, deposes and says that he is the same person that testified in the above cause on the 28th day of July, 1886. At and previous to the time he gave his said testimony he had not seen a copy of the Cowles patent No. 272,660, of February 20th, 1883, upon which said suit was brought, and was not aware of the precise or substantial nature of the invention described and claimed in said patent, a copy of which he has recently seen and has carefully read, and believes that he fully understands the same. He has also within the past week read over his testimony given in the above cause. Had deponent known of the nature of the Cowles invention and the claims of the patent he would have stated at the time his testimony was given that his sole object in covering the burglar-alarm wire made by him in the year 1860, and subsequently until he used the parafline-coated wire, was to secure a good electrical insulation by applying a second covering of thread upon the first painted layer, which first layer was painted in the usual way. His object was not to produce a non-inflam-able wire, and the wire so made by him was not non-combustible or non-inflam-able, and it was not any better adapted for electric-light conduction than the parafline-coated wire.

Deponent stated in his said testimony that the first coat of paint was "partially dried, so as to keep its place, but would admit of an impression from the next covering of thread." He did not intend to convey the idea that the paint was in such a condition as to be capable of loading the interstices of the layers of thread by the application of the second layer. It is a well-known fact that
277 for several days after paint is applied to a surface it will admit of an impression, but, although, as he used it, it would admit of such an impression, its condition was not such as would cause the threads of the second layer to force it, the paint, into the interstices and so load the wire with an abnormal quantity of paint, as is done by the process described in the said Cowles patent.

In the latter process, as deponent understands the same, a large part of the body of wet paint carried by the braided wire is forced into the interstices of both the first and second covering of thread by the act of applying the second layer of thread. In the process used by deponent, as referred to in his testimony in this cause, there was the same layer of paint in the same condition on the covered wire before the second covering of thread was applied as there was afterwards. In the Cowles process the thread layers were, so to say, surcharged with the paint, or, in other words, the paint was compelled to load the wire by being forced into the interstices of the layers of thread.

As a matter of fact, the second layer of thread was not put on by him immediately after the first layer was coated with the paint. It was some time thereafter before the second covering was applied, the

time allowed to elapse depending upon the state of the weather, for the object was to have the paint dry for convenience of handling. In no case did he apply the second layer of thread the same day the first layer was painted. None of the said wire made by deponent was a fire-proof wire.

In fact, when deponent applied the paint to the first layer of thread the thread immediately absorbed a large quantity of the oil, and when the thus painted wire was passed through the
278 piece of thick rubber to remove the surplus, which was done by him on the outside, the condition was such as to really render the covering more inflam-able than if no paint at all had been used.

Nearly all of deponent's paint-covered wire was made by putting two layers of thread on the wire, and then a coating of paint on the surface of the outer layer.

The covering of the wire made by deponent was done at one factory and the painting at another.

Deponent further says that he has learned nothing and knows nothing as to the status or proceedings in the suit since he gave his testimony therein, has no interest whatever in the result of said suit, and makes this deposition only as a matter of justice.

E. HOLMES.

Sworn to and subscribed before me this 26th day of September, A. D. 1887.

THORNE S. WALLING,
[SEAL.] *Notary Public* (184), *N. Y. Co.*

Due service hereof is hereby accepted.

MORRIS W. SEYMOUR.

And on the 22d day of March, 1888, answer to the petition for rehearing on the record, demurrer and answer to the petition for rehearing on affidavits, and affidavit of John E. Earle on petition for rehearing were filed in the words and figures following, viz:

279 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY. } In Equity. No. 455.

Answer of the Electrical Supply Company to the petition for rehearing on the record.

The Electrical Supply Company says that the prayer of the said petition ought not to be granted—

First, because it is not true that this hon. court decided that the invention of Alfred A. Cowles, upon which said bill was based, to wit, letters patent No. 272,660 and dated Feb. 20th, 1883, were solely invalid by reason of what was done by Edwin Holmes and as testified to by said Holmes in said cause; that there was put in evidence in said cause other testimony by other witnesses showing that

said letters patent so granted to said Cowles had been antici-
280 pated by what had been done by them and by others to their knowledge and in their presence; that there was a large number of patents put in evidence and referred to by the defendant which showed a state of the art which deprived the letters patent of said Cowles of any patentable quality; that it is not true that the conclusion which was arrived at by the court was based alone upon the testimony of said Holmes, but upon that of the other witnesses whose testimony was taken, and such other patents so introduced in evidence, and that such conclusion was not alone warranted by the testimony in said cause, but proved beyond all reasonable doubt the invalidity of said Cowles patent.

THE ELECTRICAL SUPPLY CO.,
By MORRIS W. SEYMOUR, *Its Attorney.*

281 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS AND COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.
} In Equity. No. 455.

Demurrer and *and* answer to petition on affidavits.

To the petition for a rehearing on affidavits filed by the complainant in the above-entitled matter the Electrical Supply Company says by way of demurrer and answer:

1. The defendant demurs to the prayer for relief because, it says, upon the facts stated in the petition the petitioner is not entitled to the relief therein sought.

2. That the alleged newly discovered evidence is immaterial.

282 3. That, if material, such evidence was easily accessible to the complainant and could have been proved prior to the former hearing.

4. Because the remedy, if any the petitioner has, is not by way of petition.

And for further answer the Electrical Supply Company says:

1. Paragraph 1 is admitted.

2. Paragraph 2 is denied. So far as the same refers to any and all statements made by Edwin Homes and to the statements therein contained in reference to the doings of John Latham and Edward Greenfield the said Electrical Supply Company has not any knowledge or information thereof sufficient to form a belief, and therefore denies the same.

3. As to the matters alleged in paragraph 3 the defendant has no knowledge or information sufficient to form a belief, and therefore denies the same.

4. Paragraphs 4 and 5 are denied.

5. As to the matters alleged in paragraph 6 the defendant has not any knowledge or information thereof sufficient to form a belief, and therefore denies the same.

283 6. As to all the allegations in said petition in reference to the testimony of Edwin Holmes, The Electrical Supply Com-

pany says, that the same do not, as alleged in said petition or sworn to in the affidavit annexed to said petition, in any material point contradict the testimony of the said Holmes already put in evidence in this case, and that in so far as they do conflict with said testimony it is in no sense newly discovered evidence, but the same was, might, could, and should have been known to the petitioner, and if said petitioner was not aware of said facts it was through its own negligence and carelessness, and it might and ought to have known all of said facts prior to the original hearing in this cause.

That the allegations in said petition for a rehearing as to what John Latham and Edwin F. Greenfield are willing to testify and the affidavits subscribed by them, in so far as they refer to the insulation of electrical conductors by the use of fibrous jackets and interposed paints, nowise contradict or qualify the testimony given by the said Edwin Holmes upon the original hearing before this court in any material or important particular, but, on the contrary, emphasize and confirm his original statement.

That the allegations in said petition as to what said Latham and Greenfield will testify and the affidavits by them subscribed are in no sense newly discovered evidence, but might, could, and should have been discovered by the petitioner by the use of due diligence; and it was through the fault and negligence of the petitioner, if
284 the same is of any importance, that it was not put in evidence before, and that said evidence would, if it were permitted to be introduced into this cause, be a repetition of testimony already in, and be cumulative in its character.

THE ELECTRICAL SUPPLY CO.,
By MORRIS W. SEYMOUR, *Its Attorney.*

285 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS AND COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

Petition for Rehearing.

JOHN E. EARLE, being duly sworn, deposes and says:

I am the same person who testified in the above-entitled case as expert on the part of the defendants.

I have carefully read the petition and accompanying affidavits of John Latham, Edwin T. Greenfield, and Edwin Holmes on the part of complainants herein. I have also read the deposition of the said Edwin Holmes, made on the part of the defendants in the above-entitled case, and believe I fully understand the same.

I understand the affidavits in the moving papers herein to attempt to define what was done by the said Holmes, as testified to by him, the said Holmes, in his original deposition.

I understand the said Holmes, in his original deposition, that he insulated electrical wire, employing paint, in three ways:
286 First, as stated in his answer to second and third Ints., page 111, Defendant's Record, "by winding a thread, larger or

smaller, as the case may be, around the wire, and that thread was covered with paint. * * * I applied it (the paint) by drawing it through a vessel containing paint and then through a thick piece of rubber or gutta-percha, which removed the surplus paint and left a smooth surface on the thread which covered the wire."

Second, in answer to Int. 9, "by covering the wire with a thicker thread and two coats or more of paint;" and,

Third, same answer, "by a thread covering and a coat of paint, then another thread covering and a coat of paint on that."

I do not understand Mr. Holmes in his affidavit in the moving papers herein to attempt to qualify his previous deposition as to the fact that he did apply fibrous jackets and paint in the methods above specified and in the same sequence of steps, but only as to the condition of the paint when the second fibrous covering was applied—that is to say, that whereas, in his original deposition, he testified that the paint when the second covering was applied (Ans. to Int. 10) "was partially dried, so as to keep its place, but would admit of an impression from the next covering of thread," he, with Latham and Greenfield, now testify that when the second coat was employed it was not applied the same day of the painting—that is, until after it had dried to a considerable extent.

By the affidavits in the moving papers herein I understand the affiants now to say that the wire made by Holmes was not a non-combustible or non-inflammable wire, and, to quote from
287 Mr. Holmes' affidavit, "It was not any better adapted for electric light conduction than the paraffine-coated wire;" and, to quote from Mr. Greenfield, "This wire was quite as inflammable as the paraffine wire, and was more inflammable after the paint was applied than before."

To demonstrate (*a*) the falsity of these statements of the affiants in the moving papers herein as to the inflammability of the Holmes wire, and (*b*) also to demonstrate that so far as making a practical wire for the market is concerned the method practiced by Holmes produced a wire the fibrous covering of which would be as thoroughly permeated with the paint as in the method described in the Cowles patent, and (*c*) that the wire made after the manner described by Holmes is as equally non-combustible as the wire made by the Cowles patent, I have made practical tests with wires of various covering.

First. I caused to be made under my personal supervision a wire with two braided coverings of cotton, applied in the usual manner, and in a manner well known long prior to the Cowles patent, without any insulating material.

A piece of this wire I introduce, it being marked "Defendant's Exhibit Cotton Covered Wire."

Secondly. I caused to be made a wire in accordance with the wire first described by Holmes in his deposition, in answer to Ints. 2 and 3, page 111, Defendant's Record—that is to say, a wire covered with a single covering of thread, then drawn through a vessel containing paint, and then drawn through a stripping device to remove
288 the surplus paint, so that the wire, when completed, consisted

of a copper wire, a covering of cotton fibre, and paint as the insulating material; the wire was thoroughly dried. This wire is introduced and is marked "Defendant's Exhibit Single Cotton and Paint Wire."

Third. I caused to be made a wire consisting of a copper core, with two layers of cotton and one coat of paint; one covering of cotton was applied; the once covered wire then run through a bath of paint; the second layer of braided covering was then added while the paint was fresh, and which is the usual method employed by these defendants for applying the two coverings of braid and the one coat of paint—that is to say, a wire having a double cotton covering, with paint interposed. This wire I introduce, and it is marked "Defendant's Exhibit Double Cotton Interposed Paint Wire."

I should here state that "electric conductors composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers," and upon which paint the second covering is laid while the paint is green, does not make the usual commercial article for electric lighting purposes, and that therefore the said "Exhibit Double Cotton Interposed Paint Wire," while it exhibits a method of covering wire which consists "in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets," is not an article such as is put upon the market for electric lighting purposes.

The wire thus covered with two layers of fibrous covering and an interposed layer of paint is, in the manufacture as practised by the defendants, thoroughly dried by being placed in a
288½ chamber with a standing heat of from 140 to 180 degrees Fahrenheit, where it remains until practically dry; then when thoroughly dry the wire is drawn through a bath of paint, thence through a wiper, to remove the surplus paint, which leaves upon the wire an outer layer or coat of paint.

Before this last coat of paint is applied, as will be seen by "Exhibit Double Cotton Interposed Paint Wire," an uncoated cotton surface is presented; this said "Exhibit Double Cotton Interposed Paint Wire" shows the wire as it comes from all the machines in the defendants' manufactory.

After the outer coating of paint, applied as I have described, the wire presents an outer surface of paint; this outer surface of paint permeates the exposed cotton on the surface and unites with the paint within, so as to make a thorough combination of the paint and fibrous layers.

I introduce a piece of wire which was first made precisely like "Exhibit Double Cotton Interposed Paint Wire," thoroughly dried, then drawn through the paint for the final coating in the usual manner. This wire is marked "Defendant's Exhibit Usual Manufacture Wire."

I also, in order to follow out the method practiced by Mr. Holmes, as testified to by him in his answer to Ints. 9 and 10 in his original deposition, and as qualified by the affidavits in the moving papers herein, applied to the wire a single covering of braid; this single covered wire then passed through a bath of paint, the same paint

as in regular use in defendants' manufactory and the same as applied to all the exhibits herein.

289 After the application of the paint the wire was drawn through a wiper to remove the surplus, and the wire with its single covering and coat of paint was then placed in the drying-room, where it remained for seven hours, with a temperature of from 140 to 180 degrees, it being removed in the evening or at the close of the days' work. It then stood until the next morning, twenty-four hours from the time of painting, seven hours of which had been under great drying heat. The thus thoroughly dried painted wire was then run through a braiding machine, and a second covering of braid applied upon the previously dried surface, then the wire with this second covering was run through the bath of paint in the same manner as I have described for "Exhibit Usual Manufacture Wire," and again dried in like manner. This wire, therefore, is precisely what is described by Mr. Holmes in answer to Int. 9, and consists of a "thread covering and a coat of paint, then another thread covering and a coat of paint on that;" but instead of applying the second thread covering to the first coat of paint, "partially dried," as stated in Mr. Holmes' answer to Int. 10, the paint was more thoroughly dried than is indicated by the affidavits in the moving papers herein. The wire which I have thus described as made in accordance with the Holmes method is here introduced, and is marked "Defendants' Exhibit Holmes Method Wire."

The "Exhibit Holmes Method Wire" and the "Exhibit Usual Manufacture Wire" differ only in the fact that the second fibrous covering was applied in the "Exhibit Usual Manufacture" while the paint was fresh, whereas in the "Exhibit Holmes Method" the

290 paint was dried before the second covering was applied. In both, the thread coverings are thoroughly permeated with paint and the interstices thoroughly filled, and whatever properties are due to the paint are substantially the same in one case as the other.

In order to test the capacity of these various wires for electrical purposes I introduced all of them into an electric current having a strength sufficient to completely consume a plain cotton covering—a current of greater strength than that used for ordinary electric lighting purposes. In this test I made a connection in an electric circuit of a portion only of each piece of wire, so that the same current would run through the said portion of each wire, leaving the balance unexposed, in order that the two portions would show, the one the original condition of the wire, and the other the condition of the wire after subjection to the electric current.

The "Exhibit Cotton-Covered Wire" was originally, as I have stated, covered throughout. That portion which now appears bare is the portion which was subjected to the electric current. As before stated, the current was of sufficient strength to consume the covering, which it did, and the absence of the covering on this part of the wire is due to the fact that it was entirely consumed under the action of the electric current.

The "Exhibit Single Cotton and Paint Wire" shows a portion discolored. This discolored portion is the portion of the exhibit which was subjected to the electric current, and shows the effect upon the wire of the same current which consumed the cotton covering of the first exhibit.

291 The "Exhibit Double Cotton Interposed Paint Wire" shows a portion of the covering as discolored. This discolored portion is that portion of the wire which was subjected to the same electric current, and illustrates its effect upon the fibrous surface of the wire.

The "Exhibit Usual Manufacture" shows a portion of the wire discolored. This discolored portion is the portion which was subjected to the same electric current before described, and illustrates the action of said current upon a wire having a covering consisting of a layer of cotton, a layer of paint, a second layer of cotton applied to the paint fresh, then dried, and a second layer applied and dried.

"Exhibit Holmes Method Wire" also shows a portion slightly discolored. This portion indicates that part of the wire which was subjected to the same electric current, and it shows the effect of said current applied to a wire the covering of which consists of one layer of cotton, a layer of paint thereon, thoroughly dried, then a layer of cotton, then a second layer of paint, dried.

The burning or discoloration in all these exhibits was produced solely by an electric current, except where the same may have been soiled from contact.

The tests were made, not on each separately, but all the wires were in the same circuit with the cotton-covered wire. I did this in preference to making tests and the wires singly, in order that the tests might exhibit positively the same current.

In the cotton-covered wire the covering was destroyed. In the other wires the effect is indicated by discoloration. So
292 soon as the cotton covering was destroyed the current was cut off and the wires allowed to cool.

From these tests and from the appearance of the wire after the trial the "Exhibit Holmes Method Wire" shows a less effect of the heat of the current upon it than does any of the other exhibits.

The "Exhibit Double Cotton Interposed Paint Wire," which is made by the method described in the patent in suit, and in numerous patents and publications, as appears in my original deposition, shows a marked discoloring effect upon the surface; but in no case, except "Defendants' Exhibit Cotton-Covered Wire," was the covering destroyed, and all may be said to be substantially fire-proof, as compared with a non-painted wire.

From the tests which I made with these wires it clearly appears that both of the methods of insulating wire practiced by Holmes as early as 1860, as appears by his deposition, in answer to Ints. 4 and 11, and as qualified by the affidavits herein, produce a wire which is practically non-combustible, and well adapted for electric lighting purposes, or to withstand a current greater than that required for electric lighting purposes, and the wire produced by the method described by him in answer to Int. 9, and fixed by his answer to

Int. 11. as being prior to 1860, shows less effect from the same current than does the wire made by the defendants, and which is in very extensive use for electric lighting purposes, and which I understand is identical with the wire manufactured under the Cowles patent.

The method employed by the defendants in making the wire "Exhibit Usual Manufacture," and which is the method de-
293 scribed in the Cowles patent, and the method employed in making the "Exhibit Holmes Method Wire," were only two, as Judge Shipman says in his opinion in this case, "of a number of methods at the hand of the patentee" at the date of the Cowles invention.

The two methods are not identical, but the result obtained is the same. In both cases paint is the only insulating material used, and it acts both as the non-conductor and as a fire-proof material.

The wire used is no different in one case than the other, because of the method employed.

Holmes, in making his wire, selected one of a number of methods known in the art; Cowles, later, in making his wire, chose to adopt another method, equally as well known in the art as Holmes', and applied the insulating material previously employed by Holmes, and thereby and unavoidably produced a wire substantially the same as that produced by Holmes prior to 1860.

From these tests which I have made, and as shown by the several exhibits herein, I am of the opinion that Latham, Greenfield, and Holmes are mistaken in their statements in their affidavits in the moving papers herein as to the practicability of the Holmes wire for electric lighting purposes and as to its combustibility.

JOHN E. EARLE.

294 CITY AND COUNTY OF NEW HAVEN, } ss:
State of Connecticut, }

Subscribed and sworn to before me this 14th day of January, A. D. 1888.

FRED. C. EARLE,
[SEAL.] *Notary Public.*

And at the term of said court held at New Haven on the 4th Tuesday of April, A. D. 1888, the parties, by their counsel, duly appeared, and said petition was fully heard, and on the 18th day of May, 1888, opinion of court was filed in the words and figures following, viz:

295 Circuit Court of the United States for the District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY }
vs.
THE ELECTRICAL SUPPLY COMPANY. }

SHIPMAN, *J.*:

These are two petitions for a rehearing of the above-entitled cause, which was decided Sept. 3rd, 1887 (32 Fed. Rep., 81). The first is

based upon an error of the court upon the record in coming to the conclusion that paint was so applied to the Holmes wire, which preceded the Cowles wire, as to produce a non-combustible insulator. The second is based upon alleged newly-discovered evidence which tends to prove that the Holmes covering was not non-combustible.

The allegations in the second petition, which explain why the testimony was not obtained before the original hearing, are an insufficient foundation upon which to base an application for a rehearing, but the strength of the case adequately appears upon the first petition, with the accompanying affidavits, which throw light upon the proper interpretation of Edwin Holmes' testimony.

The petitioners do not deny that Holmes, as early as in 1860, insulated his wire by the process which he described in his testimony and which is recited in the opinion, viz., by covering the wire with a double coat of thread, each layer being successively painted. He also used two other processes; by one he covered the wire with two layers and then painted, and by the second he painted a
296 single thread, covered, wiped off the surplus paint, dried the coat, and covered the wire with another layer of thread.

The first process, which I will call the Holmes method, produces the best insulation. The affidavits show that the first coat of paint was more thoroughly dried than Holmes seemed to represent in his previous testimony and was well dried. The affidavits also carefully state that the wire was not non-combustible. A piece of the burglar-alarm wire which Holmes put into a dwelling in or near 1872 is produced. It is a slender wire and is insulated by a single coating of painted thread. A double coating of the same kind of thread, doubly painted, if wound in the same way, would not, in my opinion, have made the article non-combustible. In view of these affidavits, I shall assume you that the Holmes burglar-alarm wire, as he made it, was not non-combustible, and that the first coat of paint had dried before the second was applied.

It is also true, and the experiments of Mr. Earle show, that an insulated wire of the usual size for electric lamp lighting, braided by the well-known method and prepared according to the Holmes system as now explained—that is, the first coat of paint having dried before the second covering was put on, will not set fire to the covering, and that the covering is non-combustible in the sense in which the term is used.

The case was decided upon the ground that no previous patent or method of insulation was an anticipation, but that, in view of the Holmes system, as the same was understood, the Cowles pro-
297 cess was not a patentable invention. The question now is whether the decision should be changed in view of the fact that the Holmes system, as he practiced it on burglar-alarm wires, did not produce non-combustible insulation.

The question is now, as before, that of patentable invention. It abundantly appears that the non-combustible insulator for inside electric lamp wires which Cowles gave to the public was practically a new and a very useful thing, but no one can read the original record without receiving the idea that, if Cowles can be consid-

ered an inventor within the meaning of the patent law, he is on the edge of the line which separates invention from mere improvement. This impression is derived from the patent itself, from the history of the art of insulating electric wires, and from the grounds upon which the patent was vindicated by the able expert for the plaintiff.

Before the introduction of electricity into dwellings for illuminating purposes a principal object of insulation was to protect the electric wire from the effect of dampness, and divers water-proof materials were used in divers ways to saturate the fibrous covering of the wire. One method was to apply insulating but combustible material, such as pitch or asphalt, to a layer of fibrous covering which was wound directly upon the wire, and while this material was still in a wet or unset condition to add to the first coat a second fibrous covering. Thus the effect of saturating double fibrous coverings by the application of the second covering while the first was wet was known. The time came when a combustible covering must
298 be displaced, and instead of a covering saturated with an inflammable material Cowles used a covering of thread, an old covering, saturated or permeated with metallic paint, the article which Holmes had used for his burglar-alarm wires, and caused the covering to be permeated in the way which must have become familiar.

The position of the counsel for the plaintiff in regard to patentability is that Cowles discovered that there was a non-combustible property in paint when applied as he applies it which enables currents used in electric lighting to be employed with safety inside of buildings. This position is stated more at length by the expert, who defines the improvement of the first claim to be "the confining and pressing into the fibrous covering of the solid material of the paint, so that such fibrous covering is filled and loaded with as much of the metallic oxides or carbonates as is necessary to render the fibrous covering practically fire-proof, and at the same time sufficient fibrous material is made use of to bind the non-combustible mineral substance of the paint, so that the same will not crack or break off under the ordinary handling to which the wire is necessarily subjected."

He says, further, that the article of the 2d claim "is distinguishable from other articles that had before been made wherein paint might have been used by the fact that the paint fills the interstices of the covering, which cannot be the case where paint is applied on the outside only or where a second layer of fibrous material is applied outside of a paint that may have become hardened to such an extent that the threads do not imbed themselves into the same."

Neither counsel nor expert really contends that Cowles
299 discovered the non-combustibility of metallic paint or that he discovered that a fibrous article clothed with metallic paint was thereby enabled to resist the effect of heat, and that when heat was applied it had a tendency to char rather than to blaze. The strength of Cowles' claim of title to invention consists in the fact that he introduced an adequate and efficacious way of applying

the metallic paint so as to make the covering thoroughly non-combustible.

There was, in my opinion, no invention either in the selection of paint as a means of non-combustible insulation or in the process of applying the paint. There was no novelty in either the knowledge of the fact that the liquid material which is applied to the fibrous covering should be applied so as to thoroughly saturate it or in the knowledge that the pressure of a second fibrous covering upon a wet and plastic covering tends to saturate each. There was no invention in the selection or ascertainment of the particular method by which the paint should be made to permeate the covering. Coverings of electric wire had been previously saturated with insulating material by the three steps which are named in the patent. It was a good way in which to cause the metallic particles of the paint to be diffused through the coverings, and other ways might easily be selected which would accomplish the same general result.

As was said in the former opinion, there was in the adoption of the patented method "only a skilful selection of one of a number of methods at the hand of the patentee." The present thor-
300 ough presentation of the character of the Holmes covering does not, in my opinion, change the result which was reached, because, however beneficial the Cowles wire is, it was not an invention.

The prayers of the petitions are denied.

Joshua Pusey and Chas. E. Mitchell, for the plaintiff; Morris W. Seymour and Benj. F. Thurston, for the defendant.

And on the 13th day of July, 1888, the following orders denying motions for rehearing on the record and on affidavits were passed and filed, viz:

301 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY
against
THE ELECTRICAL SUPPLY COMPANY.

This matter coming on upon the petition of the above-entitled petitioner for a rehearing on the record and upon answer of the defendant to the same, and after hearing the counsel of the respective parties, this court doth order that the petition of the petitioner do stand dismissed out of this court.

N. SHIPMAN,
District Judge.

302 Circuit Court of the United States, District of Connecticut.

THE ANSONIA BRASS & COPPER COMPANY
vs.
THE ELECTRICAL SUPPLY COMPANY.

This matter coming on upon the petition of the above-entitled petitioner for a rehearing on affidavits and upon answer of the de-

fendant to the same, and after hearing the counsel of the respective parties, this court doth order that the petition of the petitioner do stand dismissed out of this court.

N. SHIPMAN,
District Judge.

And on the 14th day of July, 1884, the following final decree was made and entered in said cause, viz:

303 Circuit Court of the United States, District of Connecticut.

ANSONIA BRASS & COPPER COMPANY *against* THE ELECTRICAL SUPPLY COMPANY. } In Equity.

At a stated term of the circuit court of the United States of America for the district of Connecticut, in the second circuit, held at the United States court-room, in the city of Hartford, on the 14th day of July, in the year of our Lord one thousand eight hundred and eighty-eight.

Present: The Hon. Nathaniel Shipman, district judge, holding said court.

This cause having come on to be heard upon the bill of complaint herein, the answer thereto of the defendant, The Electrical Supply Company, the replication of the complainant to such answer, and the proof, oral, documentary, and written, taken and filed in such cause, together with the exhibits therein filed, and having heard the arguments thereon made by Charles E. Mitchell and Joshua Pusey, counsel for the complainants, and Benjamin F. Thurston and Morris Seymour, counsel for the defendant:

Now, therefore, on condition thereof, it is ordered and decreed that the said bill of complaint be, and the same is hereby, dismissed with costs, taxed and allowed at $——.

N. SHIPMAN,
District Judge.

304 I, Edwin E. Marvin, clerk of the United States circuit court for the district of Connecticut, do certify that the foregoing is a true transcript of the record of said court in the cause of the Ansonia Brass & Copper Company against The Electrical Supply Company.

Seal of Circuit Court, Connecticut.

In witness whereof I have hereunto set my hand and the seal of said court, at Hartford, in said district, this 3rd day of October, A. D. 1888.

E. E. MARVIN, *Clerk.*

Endorsed on cover: Connecticut C. C. U. S. No. 165. The Ansonia Brass & Copper Company, appellant, *vs.* The Electrical Supply Company. Filed October 8, 1888.

144 U.S. 11

ADDITION TO RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1891.

No. 165.

THE ANSONIA BRASS AND COPPER COMPANY, APPELLANT,

vs.

THE ELECTRICAL SUPPLY COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF CONNECTICUT.

RECORD FILED OCTOBER 8, 1888.

STIPULATION FOR ADDITION FILED NOVEMBER 17, 1891.

ADDITION TO RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1891.

No. 165.

THE ANSONIA BRASS AND COPPER COMPANY, APPELLANT,

vs.

THE ELECTRICAL SUPPLY COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF CONNECTICUT.

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1 Supreme Court of the United States, October Term, 1891.

THE ANSONIA BRASS & COPPER COMPANY, Appellant,
vs.
THE ELECTRICAL SUPPLY COMPANY. } No. 165.

Appeal from the circuit court of the United States for the district of Connecticut.

It is stipulated by the parties to the above-entitled action, under rule 10th of this court, as amended, that the following exhibits, put in evidence in the circuit court, and those only, shall be printed and made a part of the record in this court in addition to the record already printed in this cause, namely: English patent, granted to Brown & Williams, No. 12991 of 1850; English patent, granted to John Wallace Duncan, No. 906 of 1853; English patent, granted to Felix M. Baudouin, No. 933 of 1857; English patent, granted to W. H. Horstmann, No. 434 of 1859; English patent, granted to Charles William Siemens, No. 464 of 1863; English patent, granted to William T. Henley, No. 1126 of 1864; English patent, granted to Jaloureau & Lardy, No. 2942 of 1867; English patent, granted Joseph Rogers, No. 3314 of 1870; English patent, granted to George F. James, No. 1333 of 1880; English patent, granted to Charles West, No. 2321 of 1858; English patent, granted to Chatterton & Smith, No. 2056 of 1865; also patent, granted to the same parties, No. 175 of 1861; English patent, granted to Alfred Foucaut, No. 2008 of 1869; English patent, granted to Henry Highton, No. 2547 of 1872; English patent, granted to Alexander Wilkinson,
2 No. 3083 of 1873; English patent, granted to Thomas Walker, No. 274 of 1870; English patent, granted to —— Balestrini, No. 2124 of 1856; also "Exhibit Redrawing."

JOSHUA PUSEY,
Solicitor and of Counsel for Appellant.
MORRIS W. SEYMOUR,
Solicitor and of Counsel for Appellee.

3 [Endorsed:] Supreme Court U. S. 1891, October term. No. 165. The Ansonia Brass & Copper Company, app't, *vs.* The Electrical Supply Company. Stipulation in regard to printing exhibits. Filed Nov. 17, 1891.

4 DEFENDANT'S EXHIBIT BROWN AND WILLIAMS PATENT. F. C. E., N. P. March 17, 1886.

THE ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Test: E. E. Marvin, clerk.

Second edition.

[British coat of arms.]

A. D. 1850. No. 12991.

Specification of William Brown and William Williams, the Younger.

Electric and magnetic apparatus for communicating intelligence.

London: Published and sold at the patent office sale branch, 38 Cursitor street, Chancery Lane, E. C. 1886.
Price, 1*s.* 3*d.*

5 Second edition.

A. D. 1850. No. 12991.

Electric and Magnetic Apparatus for Communicating Intelligence.

Brown and Williams' specification.

To all to whom these presents shall come we William Brown of Airdrie Lanarkshire electrician and William Williams the younger of Saint Dennis in the county of Cornwall gentleman send greeting.

Whereas her present most excellent majesty Queen Victoria by her royal letters patent under the great seal of the United Kingdom of Great Britain and Ireland bearing date at Westminster the seventh day of March (one thousand eight hundred and fifty) in the thirteenth year of her reign did for herself her heirs and successors give and grant unto us the said William Brown and William Williams our exors admors and assigns her especial license full power sole privilege and authority that we the said William Brown and William Williams our exors admors and assigns or such others as we the said William Brown and William Williams our exors admors or assigns should at any time agree with and no others from time to time and at all times during the term of years therein expressed should and lawfully might make use exercise and vend within England Wales and the town of Berwick-upon-Tweed and in the islands of Guernsey Jersey Alderney Sark and Man and also i all her said majesty's colonies and plantations abroad save an except the provinces of Canada Nova Scotia and New Brunswic and the island of Prince Edward in North America our invention o "improvements in electric and magnetic apparatus for indicating

and communicating intelligence" in which said letters pat-
6 ent is contained a proviso that we the said William Brown and William Williams or one of us should cause a particular description of the nature of our said invention and in what manner the same is to be performed by an instrument in writing under our hands and seals or under the hand and seal of one of us to be inrolled in her said majesty's high — of chancery within six calendar months next and immediately after the date of the said in part recited letters patent as in and by the same reference being thereunto had will more fully and at large appear.

Now know ye that in compliance with the said proviso we the said William Brown and William Williams do hereby declare that the nature of our said invention and the manner in which the same is to be performed are fully described and ascertained in and by the following statement thereof reference being had to the drawings hereunto annexed and to the figures and letters marked thereon that is to say.

Our invention consists

First of means of obtaining what is known as a step by step rotating motion to axes of apparatus for indicating and communicating intelligence.

Secondly Our invention relates to obtaining electricity for the purpose of indicating and communicating intelligence by induction.

Thirdly Our invention consists of improvements in apparatus for giving signals by sound.

Fourthly Our invention consists of means of obtaining better insulation of the wires employed in apparatus used for indicating and communicating intelligence.

Fifthly Our invention relates to connecting wires used for telegraphic purposes.

And in order that our invention may be most fully understood and readily carried into effect we will proceed to describe the means pursued by us.

(Here follow diagrams marked pp. 16, 17, 18, 19, & 20.)

Description of the Drawings.

Figure 1 shows a plan. Figure 2 an edge view partly in section. Figure 3 a plan view of the parts laid open and figures 4. 5 and 6 various detail views some of which are on an enlarged scale of apparatus for obtaining a step by step rotating motion to an axis *a* which turns in suitable bearings at *b*. *b*. On the axis *a* is a tubular magnet *c* its poles being on either side as hereafter explained. On the axis *a* is fixed the pointing hand *d* in front of a dial and the arrangement or combination of electro-magnets and magnet is such
7 that the hand can be caused to proceed step by step from and to zero in either direction either continuously or interruptedly these motions being obtained at pleasure. *e*, *e*, are two horse-shoe electro-magnets which cross each other and their poles are provided each with a continuation piece e^1 made into a section

of a cylinder and we prefer that these sections of cylinders e^1 where they come near to each other should be separated by a brass plate by which means a complete cylinder will be composed with separate poles and it is within the tubes composed of these poles of the two electro-magnets that the tubular magnet *c* rotates by a step-by-step motion. We would remark that we do not confine ourselves to the use of tubular magnets for these purposes but we prefer to employ them over any other form of magnet. We obtain tubular magnets by using hard tubes of steel. And in order to obtain the poles at the sides we cause each such tube of steel to be placed longitudinally in contact with and between two plates of iron one of which plates of iron is on one pole and the other plate is on the other pole of a powerful electro-magnet so that the two plates with the steel tube between them may be said to form the keeper of the electro-magnet by which means when electric currents are passed the steel tube will become a magnet having its two poles on either side of its longitudinal axis. And if it be desired to use more than two electro-magnets in obtaining a step-by-step rotating action to an axis having thereon a tubular magnet then in place of only having two magnetic poles longitudiually in a tube of steel that is one on either side of the longitudinal axis several poles may be obtained to the same steel tube by acting thereon simultaneously on several opposite sides of the tube by different electro-magnets. Thus supposing that it be desired to make a tube with four poles then by having the tube of steel placed between four plates of iron in planes at right angles to each other and these four plates of iron be connected two with one electro-magnet and the other two plates with another electro-magnet so as to connect the poles of the two electro-magnets through the tube of steel when electric currents are passed and two electro-magnets are simultaneously formed the tube will have four magnetic poles longitudinally thereof and so on according to the number of poles desired to be obtained to a tube of steel. The tubular magnet *c* having two poles on either side of its longitudinal axis works within the tube formed by the parts e^1 of the two electro-magnets *e* and these two electro-magnets are in connection with two line wires of an electric telegraph and the apparatus is so arranged as hereafter explained that the poles of the electro-magnets may be changed and both magnets may be simultaneously in action on the magnet *c* and also so that only one of the electro-magnets and it is by these means that the axis of the magnet *c* may be made to make a succession of steps so as to complete a circuit or it may be caused to make several steps forward and then one or more back or it may be caused to make steps of movement back and then forward according to the arrangement of the code on the dial employed.

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We will now describe this action with reference to the code shewn by the dial represented in the drawing but the same may be varied. *f. g. h. i. j k* are a series of plates which are in connection with the various wires used by means of the terminals f^1. g^1. h^1. i^1. j^1. k^1. The two outermost wires are in connection with the poles of the battery and each of the plates *f, g, h, i, j k* is in connection with one of the

plates f^2. g^2. h^2. i^2. j^2. k^2. by means of the metal springs f^3. g^3. h^3. i^3. j^3. k^3. (shown by yellow lines) except that the tendency of the spring f^3 is to remain a short distance from its plate f and it is brought into connection therewith when desired to complete the circuit by pressing on the rod l such rod l being borne upwards by means of the slight spring l^1. The plates g^2. h^2. i^2. j^2. have each a terminal g^4. h^4. i^4. j^4. formed to receive wires g^5. h^5. i^5. j^5. respectively which wires are retained by the binding screws as shown and these wires g^5. h^5. i^5. j^5. communicate with the coil wires of the magnets used. The plates f^2. g^2. h^2. i^2. j^2. k^2. in order to their not being in metallic contact are secured to the ivory rim m which is secured to the plate n and this plate n is supported by the pedestals o to the framing as shown. The plates f^2. g^2. h^2. i^2. j^2. k^2. also carry other pedestals f^6. g^6. h^6. i^6. j^6. k^6. to which are affixed as shown spring connections f^7. g^7. h^7. i^7. j^7. k^7. for making contact with the periphery of the cylinder p and it is by means of this cylinder p that the direction and order in which the currents shall flow is regulated so as to obtain the required step-by-step motion to the pointer d. The cylinder p is formed of ivory or other suitable non-conducting material to which are attached the metal plates p^1. p^2. which form parts (insulated from each other) of its circumference against which the nibs of the spring connections f^7. g^7. h^7. i^7. j^7. k^7. rest as shown. p^3 are parts on opposite sides of the circumference of the cylinder p formed of ivory or other non-conducting material. The object of which pieces p^3. is that supposing the electricity to be flowing through the apparatus and the nibs of two spring connections which by means of the wires are in connection with one of the magnets are resting on those parts p^3 then the electricity will not flow through that magnet. The cylinder p is affixed to the axis p^4 which turns in the framing as shewn there being a handle p^5 fixed thereon to give the required movement thereto. In order to the cylinder p when turned resting in the required position for the time being the axes p^4. carries a tooth wheel p^6. such wheel being cut as shown to receive the rollers p^7 each of which is supported upon
9 a lever p^8. which turns upon a centre p^9. and is borne against the wheel p^6. by the spring p^{10}. The dial shows the order in which we arrange the letters of the alphabet and the figures employed but we do not confine ourselves to such arrangement. And we proceed in order to obtain the required step-by-step motion to point to the various letters and figures in the following manner —The spring connections f^7 and k^7 from the battery are constantly pressing against the metal surfaces p^1. p^2. and we will suppose the spring connection f^7. to be in communication with the north pole of the battery then the other spring connection or connections the nibs of which for the time being are resting against that plate p^2 will be positively electric and the other spring battery connection k^7 will be from the south pole of the battery and its nib will be resting against the plate p^1. consequently the spring connection or connections which for the time being are resting on that plate p^1. will be negatively electric then if we suppose the wires h^5. j^5. to be in connection with the horse-shoe magnet e^3 e^5 and the two wires g^5. i^5. in

connection with the other magnet the arms (3) and (4) will be north for the time being and the opposite arms (5) and (6) south for the time being. But in order that this may be more clearly understood we will refer to the diagram figure 7 where *c* represents the steel cylindrical magnet. The letters N and S represent the poles at the end of that magnet and the connection *l* being pressed down so as to make contact with the battery the electricity will flow and the cylinder *c* will remain with its south pole as shown with the pointer pointing to the line of letters A. B. C. D (on the dial plate figure 1) then if it be required to point to the line of letters E. F. G then the cylinder p' will be turned one eighth of a revolution by which the spring connections h^7. j^7. will be thrown off either of the plates p^1. p^2. and the electricity ceasing to flow through the wires h^5. j^5. the coils of the magnets (3). (5). will cease to be effectively magnetic whilst the other magnet will retain its magnetic force but the influence of the magnet (3). 5 being lost on the cylinder *c* that cylinder will move partially round so as to bring its south pole to the north pole (4). of the magnet (4) (6) and the pointer will point to the line of letters E. F. G. Then if it be required to point to the line of letters H I J. by turning the cylinder *p* another eighth of a revolution the nib of the spring connection h^7 will be resting on the plate p^1. and its opposite spring connection j^7 will be resting on the plate p^2 by which the poles of the magnet (3) (5) will be reversed the arm (5) becoming north by which the cylinder *c* will be drawn partially round with its south pole between the two poles (4) (5) and its pointer will point in the line of the letters H. I. J. Thus may the various step-by-step movements be obtained to the pointing hand and if in place of pointing in succession to the successive lines of letters it be required to pass, say for instance, from the line of letters E. F. G to the line of letters K. L. M. then no rest will be allowed to take place at the line H. I. J. but the movements of the apparatus will be caused rapidly to follow each other and in like manner may other selections be made. And we would here state that in making the selections for letters we proceed as stated to cause the pointer *d* to move from left to right when however we are selecting for figures we proceed from right to left and the pointer will be found by taking the instructions above given as the basis upon which to act to point to those lines of figures. And in order that it may be understood which of the letters or figures are intended to be selected in the different circles when the lines of figures or letters are pointed at we have found the following rule to answer well. That if the pointer rests without making any back movement when it comes to any line of letters or figures then the letter or figure nearest the centre of the dial is intended to be referred to but if after the pointer has stopped opposite any one of the lines of letters or figures it is by means of the apparatus as above described caused to make a motion back and then resume a position against a particular line of figures or letters then the letter or figure in the second circle from the centre is intended to be selected and if the figure or letter in the third circle from the centre be the one intended then

the pointer should in like manner repeat such back motion and resume its position opposite the selected line and so on for other letters or figures in other circles should they be employed. In constructing our horse-shoe electro-magnets we prefer them to be formed so that each arm is composed of two coils of wires. The first coil is formed upon the cylinder 7 and the second upon the cylinder 8 and passed over the other. The outer and inner wires are then connected together at their ends and used as a single wire.

We would here state that sometimes in place of making use of an electro-magnet as above described we simply make use of electric coils and we have in figure 8 shewn an arrangement of electric coils which we have found to answer the purpose. The centre part of the frame is formed cylindrical to receive the steel tube *c* such as above described and the mode of acting with these electric coils will be the same as above described with respect to the electro-magnets.

We will now proceed to describe the second part of our invention.

In place of employing galvanic batteries direct to obtain currents of electricity in indicating & communicating intelligence by electric currents we make use of electricity obtained by induction from electro-magnets formed by a coil of insulated wire upon iron or nickel charged by voltaic electricity.

11 We will now describe the means of sounding alarums or communicating intelligence by sound. The first of these apparatus depends for its action on the use of what we call compound electro-magnets of soft iron or nickel one of which is on an axis and moves freely whilst the other is fixed and has the coils of wire wound around the same and the effect of passing a current of electricity through the same will be that both parts will be similarly converted into electro-magnets. In this apparatus the one piece of soft iron or nickel forms part of the cylinder around which the coils of wire are formed. The other piece of soft iron or nickel which is upon an axis is bent into the form of a partial cylinder as shewn. This apparatus is shown by figures 9. 10. 11. 12. 13 and 14 which respectively represent a plan a side view a horizontal section and part of a vertical section also details thereof on a larger scale. *a* is the cylinder the part a^{x} of which is formed of soft iron or nickel. Upon this cylinder is wound the wire to receive the current. *b* is the other piece of soft iron or nickel which is bent into the form of a partial cylinder and is supported upon the axis *c* which is formed with centre points by which it is supported in bearings as shown. This axis *c* also carries the arm *d* at the end of which is formed the hammer *e* for striking the bell *f*. When the parts are at rest they assume the position shown by the drawings but when a current of electricity is caused to flow through the coil of wire the pieces of soft iron or nickel become magnetic and the parts repel each other so as to cause the arm *d* to move in the direction of the arrow. Then when the current is broken the hammer will fall towards and strike the bell.

The second apparatus for sounding alarums depends for its action

on the use of permanent magnets on axes working within a tube part of which is of soft iron or nickel. The magnet in this case may be two bar magnets bent into the form of half tubes with the poles reversed and fixed on a common axis or the magnet may be a tubular magnet one side being magnetised by one electro-magnet and the other side of the tube rendered magnetic by means of another electro-magnet. The poles of the two electro-magnets when subject to electric currents being in contact respectively with the two ends of the steel tube on opposite sides by which a steel tube will be converted into a magnet each end having two dissimilar poles and in like manner may tubes of steel have more than two magnetic poles obtained thereto using two three or more electro-magnets in connection with the ends of a tube of steel.

The alarum instrument is shewn at figures 15, 16 and 17 which shew respectively a plan, a front view and a back view. *a*, being an axis of a spring barrel of clockwork which by the chain gives motion to the axis *b*, a wheel on which gives motion to the 12 pinion *c*, on the axis *d*, on which is the wheel *e*, which drives the pinion on the axis *f*, upon which are fixed the excentrics *g*, *g*, which carry the ends of the rods of the hammers *h*, *h*. In this alarum there are two hammers *h*, *h*, and their arms or rods h^1, h^1, are formed into straps or bands to embrace the excentrics *g*, *g*, and when motion is given to the axis *f*, to causes those excentrics to revolve the hammers will by the friction of the bands on the surface of the excentrics be carried round with them and strike the bell *i* and then having struck the bell the hammers will be drawn away therefrom by the motion of the excentrics. On the axis *f*, is affixed the arm *j*, which by coming against the stop *k* prevents the axis *f*, revolving till the stop is removed out of the way when the spring or other maintaining power used will cause the axis *f*, to revolve and give motion to the hammers. The stop *k*, is affixed to the axis *l*, upon which is affixed the lever *m*, which is constantly borne with its upper end towards the centre of the machine by means of the spring *n*, acting against the under end of the lever *m*, and it is by means of the weight *o*, at the end of the lever o^1, falling against the upper end of the lever *m*, that the stop *k*, is removed to release the arm *j*. The lever o^1, is affixed to the axis *p*, which turns in bearings carried by the frame as shewn and to this axis *p*, is affixed the steel cylinder *q*, which is differently magnetised at the opposite ends of its opposite sides and it is supported within the cylinder *r*, which is partly formed at r^1, of soft iron or nickel and receives the coil of wire, and when electric currents are passed through such coil the cylinder *q*, will be acted upon to deflect the arm o^1, into the position indicated by red lines when the stop *j*, will be removed and so long as the current is flowing through the coil of wire the stop will be held away and the bell will continue to be struck by the hammers. So soon as the circuit is broken and electricity ceases to flow through the coil the arm o^1, will be raised again by the light spring *s*. carried by the lever s^1, which at each revolution of the wheel *e*, is raised by the pin e^1, on that wheel coming against the arm s^2, on the axis of the lever s^1.

Another mode of obtaining signal or alarum apparatus consists in using a step-by-step motion such as described under the first part of our invention to give motion to an axis upon which is placed a worm wheel which by taking into a screw wheel in the side of which is placed a pin which each time of the revolution of the wheel will be caused to come in contact with the short end of a hammer lever and so soon as the pin in the revolution of the wheel has passed such short end of the hammer lever the hammer will be suddenly released and strike the bell.

We will now describe the improvements in insulating wire used for indicating and communicating intelligence. This part of the invention consists in enclosing wire to be used for telegraphic purposes within strands of yarn in like manner to braiding or plaiting and when several such wires are to be combined together we in like manner combine them. Figure 18 shews a side view, figure 19 a plan and figures 20, 21 and 22 horizontal sections of apparatus which we use for this purpose. This apparatus is very similar to an ordinary braiding machine except that the position and mode of working of some of the parts are inverted. *a*, *a*, is the framing of the machine *b*, is the main or driving shaft which is driven by means of the crank handle b^1, or it might be by other means. Upon the shaft *b*, is affixed the bevilled pinion *c*, which takes into and drives the bevilled pinion *d*, on the upright shaft *e*, the lower end of which is supported in a bearing carried by the main framing whilst the upper end is supported by a bearing carried by the lever *f*, in order to the parts being thrown out of gear to stop the machine when any of the strands break or the bobbins become exhausted as will be afterwards described. The upper end of the shaft *e*, carries the pinion e^1 which takes into and gives motion to the pinion *g*, upon the upright shaft g^1 which is supported in bearings carried by the framing as shewn and at its upper end this shaft g^1, carries the pinion g^2, which takes into and gives motion to one of the pinions *h*, and that pinion *h*, communicates its motion to the other pinions *h*, as shewn. These pinions *h*, are affixed to the spindles h^1, which are guided by the framing as shewn and carry the discs h^2, by which aided by the pieces *i*, the motions of the bobbins *k*, are controlled as is well understood by persons accustomed to the use of braiding machines. *l* is the wire being covered and it will be seen that this wire passes down through the machine from any suitable bobbin or otherwise and passes under a roller *m*, up around one of the grooves formed on the drum *n*, upon the shaft n^1, which receives motion from the shaft g^1, by means of the screw wheel g^3, taking into the worm wheel n^2, on the shaft n^1. The strands from the bobbins *k*, are each conducted as shewn under the pin *o*, in the upper part of the weight o^1, (in each of the bobbins) thence over the pin *p*, and down through the weight o^1, to the wire *l*. The weights o^1, are each formed cylindrical to admit of the strands passing down through them as shewn. The lever *f*, is held in position so as to keep the pinion e^1, in gear with the pinion *g*, by means of the cord *q*, which passes round the drum *r* which has an arm r^1, projecting upwards so as to be held

by the hook s projecting from the spindle s^1, and this spindle has another arm s^2, with its end bent upwards so as to be received within the slot formed in the arm t, projecting from the spindle t^1. These spindles s^1, and t^1, have each an arm s^3, t^2, which projects into the machine so as to be in the way of either of the weights o^1, should either of the strands break or the bobbins become
14 exhausted thereby allowing either of the weights to descend. And the spindles s^1, t^1 are connected together as described by means of the arms s^2, t. in order that either being acted upon by a falling weight may more quickly withdraw the hook s, and release the arm r^1, and consequently the lever l, which will then be forced outwards by means of the spring u, and thus withdraw the pinion e^1, from gear with the pinion g, and stop the machine. In covering a single wire we prefer to combine gutta percha with the strands and for this purpose we make use of the trough c which is formed with a jacket for the purpose of receiving steam through the pipe v^1, by which the gutta percha will be kept in a soft state so as readily to combine with the wire and the strands to form a coating thereto.—In combining several wires we use a machine similar to the one just described for coating a single wire but of larger dimensions and we pass the several wires down the tube a^1, and keep the several covered wires from coming in contact with each other by means of other strands or cords which form a centre and such centre cords or strands and also the covered wires are kept in their relative positions by passing through guide holes formed in plates supported at each end of the tube a^1, and the strands are plaited or braided on the outside of such combined wires and strands in like manner to what has already been described with respect to a single wire. And having covered in this manner the combined strands and wires we again pass them through a similar machine and obtain another covering of yarn but in this case we make use of vegetable pitch in place of gutta percha as the coating material. And we prefer in like manner to cover the wires a fourth time with coir saturating it at the same time with mineral pitch.

We will describe the fifth part of our invention. Figure 23 shews two views of parts of an electric telegraph wire which are connected by means of the screw connection A which is of the same metal as that composing the two pieces of wire B. B. The connection A which acts as a nut is formed with a screw in its length corresponding with the male screws on the ends of the wires and we prefer that the thread on the wires should not be continued so far along the wires as to be the length of the connection A and then when the connection is applied the ends of it may by pressure be brought in close contact with the wire.

Figure 24 shews another mode of forming a connection. In this case the ends of the wire B B are rivetted into the tubes C, C, one of which is formed with a male and the other with a female screw by which they are united.

Having thus described the nature of our invention and
15 the manner in which the same is to be performed we would have it understood that we do not confine ourselves to the

details as herein given so long as the peculiar character of any part of our invention be retained but what we claim is

First The means of obtaining a step-by-step rotating action to axes by means of the combined action of electro-magnets and magnets.

Secondly We claim the transmitting of electric currents by induction from an electro-magnet formed by a coil of insulated wire upon iron or nickel charged by voltaic electricity.

Thirdly We claim the means of giving signals by sound and sounding alarums herein explained.

Fourthly We claim the causing wire used for electric telegraphic purposes to be covered for the purpose of insulating the same in the manner herein described.

Fifthly We claim the modes of connecting wires used for telegraphic purposes as described.

In witness whereof we the said William Brown and William Williams have hereunto set our hands and seals this thirty-first day of August in the year of our Lord one thousand eight hundred and fifty.

WILLIAM (L. S.) BROWN.
WILLIAM (L. S.) WILLIAMS, JUN'R.

And be it remembered that on the thirty-first day of August in the year of our Lord 1850 the aforesaid William Brown and William Williams came before our said lady the Queen in her chancery and acknowledged the specification aforesaid and all and everything therein contained and specified in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

CROSBY.

Enrolled the sixth day of September in the year of our Lord one thousand eight hundred and fifty.

London: Printed by Eyre and Spottiswoode, printers to the Queen's most excellent majesty. For her majesty's stationery office.

21 ANSONIA BRASS & COPPER CO. } vs. THE ELECTRICAL SUPPLY CO. }

DEFENDANT'S EXHIBIT DUNCAN PATENT. F. C. E., N. P. March 17, 1886.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

(2-175.)

20661.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the bound volumes of this office of the specification and drawing in the matter

of the English letters patent granted John Wallace Duncan April 14, 1853, number 906, for certain new combinations of gutta percha with other materials and the method of applying such for use.

Seal Patent Office, United States of America.

In testimony whereof I, M. V. Montgomery, Commissioner of Patents, have caused the seal of the Patent Office to be affixed this 26th day of October, in the year of our Lord one thousand eight hundred and eighty-five, and of the Independence of the United States the one hundred and tenth.

M. V. MONTGOMERY,
Commissioner.

22 A. D. 1853. No. 906.

Combining Gutta Percha with Other Materials and Applying the Same.

Letters patent to John Wallace Duncan, of Grove End road, St. John's Wood, in the county of Middlesex, gentleman, for the invention of "certain new combinations of gutta-percha with other materials and the method of applying such for use."

Sealed the 8th July, 1853, and dated the 14th April, 1853.

23 Specification in pursuance of the conditions of the letters patent filed by the said John Wallace Duncan in the Great Seal Patent Office on the 14th October, 1853.

To all to whom these presents shall come, I, John Wallace Duncan, of Grove End road, Saint John's wood, in the county of Middlesex, send Greeting:

Whereas her most excellent majesty Queen Victoria, by her letters patent bearing date the fourteenth day of April, in the year of our Lord one thousand eight hundred and fifty-three, in the sixteenth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said John Wallace Duncan, her special licence that I, the said John Wallace Duncan, my executors, administrators, and assigns or such others as I, the said John Wallace Duncan, my executors, administrators and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, and vend within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man an invention for "cer-

24 tain new combinations of gutta-percha with other material and the method of applying such for use," upon the condition (amongst others) that I, the said John Wallace Duncan, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said invention and in what manner the same was to be performed and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent:

Now, know ye that I, the said John Wallace Duncan, do hereby

declare the nature of my said invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement thereof, reference being had to the two sheets of drawings hereunto annexed and to the letters and figures marked thereon—that is to say—

My invention consists of the manufacture of adhesive water-proof cement, of gutta-percha, and other matters hereinafter specified for the purpose of uniting securely flexible or fibrous materials
25 or rigid substances when heated to the necessary degree, joined, and allowed to cool.

The component parts of the cement are varied according to the rigid, flexible, or fibrous nature of the substance to be united. It also refers to the preparation of sheet, tubular, and other forms, suitable as articles of commerce, with a uniting or adhesive surface, which may be either partially or entirely coated with the adhesive matter, which at ordinary temperatures remains hard and inadhesive, but by the application of the requisite degree of heat it presents an adhesive surface suitable for attaching to the desired object.

For uniting very thin sheet gutta-percha or gum muddar to silk or other fine fabrics I prepare my cement in the following proportions: Forty pounds of gutta-percha, three parts caoutchouc, three parts shellac, fourteen parts Canada balsam or Venice turpentine, thirty-five parts of balsam from the liquid amber styraciflua or styrax, four parts of gum mastic, and one part oxide of lead. I compound a cement suitable for uniting sheet percha to leather,
26 as for shoe soles, of fifty pounds of gutta-percha, forty parts of Venice turpentine, four parts of shellac, one part of caoutchouc, and five parts of the styrax before mentioned.

For cementing and joining leather I compound a cement of sixty parts of gutta-percha, ten parts of shellac, two parts of caoutchouc, twenty parts of Venice turpentine, and eight parts of styrax.

A cement adapted for uniting wood or caulking ships I compose of about fifty-five parts of gutta-percha, fifteen parts of shellac, twenty-five parts of Venice turpentine, and five parts of pitch.

To unite rigid substances, such as metals, glass, stone, and earthenware, I compound a cement of forty-five parts of gutta-percha, twenty parts of shellac, five parts of gum mastic, half a part of oxide of lead, three parts of styrax, twenty-six and a half part of Venice turpentine (mixing metallic powders, such as cast-iron borings, with this cement improves it for fixing iron railings to stonework and such like purposes).

To cement and unite small particles of material, such as
27 leather shavings, silk waste, hair, and the like, I compound a cement of twenty parts of caseum, fifteen parts of glutin, five parts of coagulated (or livery) linseed oil, one part of the oxide of lead, twenty-five parts of Venice turpentine, and thirty-four parts of gutta-percha. About eight per cent. of gum ammoniacum may be introduced with advantage in the cement instead of a like portion of the gluten.

The above proportions may be varied, but those given I have found to be the best for the several purposes described.

In compounding these cements I proceed by heating the balsams to the requisite degree for dissolving the harder gums, which I then introduce. The gums when dissolved in the balsams are then put into a machine with the gutta percha, also heated, and the other component parts, in which the whole is thoroughly amalgamated by mastication. From this machine it is expressed in a state suitable for use and may by its agency be applied directly to the article to be coated with such cement, as described in the following descriptions of drawings.

When caseum or glutin forms a component part or parts of the cement it is preferable to combine such matters in the mas-
28 ticating machine with the balsams alone, without heat, then introduce the gutta-percha in a heated, plastic state and thoroughly blend and masticate the whole intimately together.

(Here follow diagrams marked pp. 42 & 43.)

Fig. 1, sheet A, represents an improved apparatus for combining and masticating the several compounds before described, which is also applicable for distributing and applying the cements to the several substances required. Figure 1 exhibits a longitudinal vertical section of the machine, and figure 2 a transverse vertical section of the same.

It consists of a double cylinder or casing, A A, in which two toothed cylinders, B B, revolve. The cylinders B B are furnished with a number of teeth, *a a*, and are placed in such proximity that the teeth *a a* of the one cylinder intersects those of the other. The teeth *a a* are arranged in helical series around the cylinders B B with sufficient spaces between each that the teeth of the other cylinder may pass between and intersect each other. The several series of teeth *a a* of one cylinder are arranged in opposite helices to that of the
29 several series on the other cylinder. The form of these teeth *a a*, as will be seen in figure 2 and in the enlarged partial view, figure 3, is that of a quadrant with the curve advanced side of the tooth bevelled to correspond with the rake of the helix. The external cylinder or casing A A is double in order to the circulation of the steam or hot water to keep the material in a plastic state while under operation; C is the hopper to introduce the several materials, and D is a discharge orifice which may be varied according to the application of the compounds. The rollers are geered together and revolve in opposite directions, as indicated by the arrows in figure 2, which motion, by reason of the direction of the helices, tend to force any matters introduced at the hopper C towards the discharge D. As before mentioned, the balsams are heated to a temperature that will dissolve the gums and are separately introduced into this masticating machine with the gutta-percha, which is also heated to a plastic state. The masticator being in motion, the several ingredients are intimately combined and amalgamated with each other.

30 In order that the material under operation shall not be entirely carried round by the toothed cylinders, rows of stationary teeth or prongs, *b b*, are placed along the interior edge or apex of the case between the cylinders. The materials, in working, are carried round by the teeth *a a* but are stopped for the most part by the teeth *b b*; these are also furnished with inclined faces which contribute to carrying the matters forward towards the discharge D. The action of the rotating teeth is to comminute and thoroughly mix up the several ingredients introduced by kneading, amalgamating, and blending them together. To give time for the proper mastication & elaboration of the materials the discharge orifice D should be fitted with a slide or apparatus whereby to stop the discharge. Two curved plates, *c c*, are fixed to each cylinder, B B, near the discharge, which embrace a considerable portion of the circumference; these plates work with their sides in close proximity to each other and produce a greater discharge pressure than is produced by teeth *a a*. In order to coat sheets of metal or other material

31 it has simply to be passed under the discharge orifice D, which is of a breadth equal to the width of the material or coating of sheet required and so as to discharge a given thickness of cement. Rollers *d d d* are disposed for carrying the material to be coated, which, when of a flexible or fibrous character, must be placed in close proximity, or it may be received in a suitable travelling slide. The cement being discharged in a semi-fluid and heated state impinges on the material placed to receive it, to which it firmly adheres; the force of the discharge carries the receiving material along and bringing forward fresh surface to be coated, and so distributing it over the entire length of material.

In coating sheet metal such as brass and copper it is necessary that they should be heated to remove the film of aerial oxide before they approach the discharge orifice, taking care that the temperature is reduced below that of the cement.

In this manner woven fabrics, leather, and sheet metals may be thus covered with a cementing surface adapted to the character of the material to be so treated. In coating sole or band leather

32 with this cement I remove any loose or refuse portion in order to present a good surface for adhesion.

Figure 4, in sheet A, represents in vertical section a machine for the manufacture of tubes or sheets of different plastic materials in lamina. It consists of three series of concentric masticators, into which the different materials are conveyed by spouts 1 2 3 from the preparatory machine last described.

These masticating machines are constructed on the principle of the masticator shewn at figure 1. Each masticator represented consists of three concentric cylinders, *f g h*. The inner cylinder *f* of the three is stationary and sustains the fixed prongs or teeth *b b*, while the outer cylinder *h* is fitted so as to rotate on *f g* as a centre and carries the movable teeth of the next larger masticator. The middle cylinder *g* is simply to provide a space, *i*, in which steam or hot water circulates.

The moving teeth of the centre masticator are arraged helically

round the shaft K, and are all formed, as before described, with inclined advance edges to force down the materials introduced.

33 The whole series are similarly constructed and are each suitably geered with the main driving shaft *l*. The bed plate F has concentric series of openings, *m m*, through which the plastic matters are expressed and from which they are received in corresponding mouth-pieces *o p q*, which unite in such manner as to bring the several materials together while plastic and cause them to combine and adhere together. By this means a tube will be formed and delivered consisting of different thicknesses of various plastic materials.

This machine may be so arranged that by omitting the inner masticator a tube of metal-woven fabric or other material may be drawn through the centre, and the different materials expressed caused to converge upon and adhere to it.

The machine is also suitable for the manufacture of sheets of gutta-percha, gum muddar, or other plastic materials in lamina, by simply cutting the tube so formed or forming the circular discharge orifice less than the entire circle.

34 The several mouth-pieces *o p q* have space for hot water or steam to circulate to keep up the heat of the matters to the point of contact. The drawings will suggest the necessary arrangement required for different purposes, observing that when any non-adhesive material is to form a part of the article manufactured a cement must be expressed between any such materials that will not otherwise adhere.

Figures 5 and 6, sheet A, represent a machine for manufacturing sheets of plastic materials in lamina, figure 5 being an end elevation and figure 6 a lateral vertical section. It consists of three or more cylinders, H I K, whose plungers or pistons are attached to a cross-head, L, depending from and actuated by the piston of a steam cylinder, M, which is raised or depressed according as a high pressure of steam is admitted above or below the piston.

The plastic materials are introduced into cylinders H I K by the tubes N from the masticator or masticators, figure 1, in which they are previously prepared. This is effected during the up stroke of the piston. The communication is of course stopped during the down stroke. The cylinders H I K being thus fitted, the

35 downward pressure of the steam forces the contents out through their several mouth-pieces, and so as to adhere to each other by their own adhesive properties or by an adhesive cement contained in the intermediate cylinder. The several cylinders and discharge orifices are furnished with steam jackets to maintain the temperature. Instead of using steam pressure I sometimes employ hydraulic pressure, exerted by means of pumps on a hydraulic ram, placed in a position similar to the steam cylinder. In some respects hydraulic pressure is preferable, as the great force required entails the necessity of using a large steam cylinder. For the purpose to admit of a continuous supply of the various plastic matters forming the combined sheet two series of these machines may be united at the delivery orifice, and with a tap to shut off the communication

with either series of the forcing cylinders, in order that one set may be filling while the others are discharging, thereby producing a continuous band or sheet.

B exhibits at figure 7 a principle of machine for applying cement for use to unite together wire, gutta-percha or gum madder,
36 textile fabric, metal strips or bands in concentric layers, suitably interposed to isolate and protect the wires and strip metal, in the form of a round manufactured rope, suitable for conducting electricity for telegraph purposes. In this principle of machine the cement may be applied to paper, sheet metal, or suitable textile fabric or other material by uniting such in the form of round, angular, or other formed tubes, which may be cut into lengths for hat bodies, cases, boxes, and other articles.

This machine consists of one, two, three, or more secondary masticators, as at P, R, S, into which similar or different materials are conducted from the primary masticators. The materials are further elaborated in P, R, and S, and expressed through suitable orifices at bottom.

Figure 8 represents some of the lower parts of this machine in plan. The above arrangement represents the coating a single wire, *t*, as a centre. This wire is delivered from a coil, T, mounted in bearings supported and forced up by springs so as to keep the wire up
37 to the stop roller *u*, and so opposite the entrance orifice. In passing through the centre chamber of masticator the wire becomes coated with cement, and thence through the material of the outer chamber, a coating of which also adheres to the cement, the thickness of both being regulated by their respective orifices from which they emerge, as will be readily understood. Another coating of cement may be thus applied or the last may be of an adhesive character in order to prepare it for the succeeding coat. U is a coil of sheet metal, or it may be textile or other suitable fabric, of a proper width to envelope the figure Y expressed from S. In order that this material may surround Y and the edges thereof lap the ingress aperture is fitted with a volute apperture or cone-piece, V, cross-sections of which are shewn at V^1 V^2. The sheet material is received at the segmental mouth V^1, by which it is gradually contracted and curved until the circle is completed, and the edges of the material have a sufficient lap for the purpose. The core-piece Y, first produced, passed through the centre of volute mouth-piece V, receives the sheet metal or fabric which adheres to
38 it, and then enters the cement chamber; as in the case of the wire *t*, the surface becomes coated with cement or other plastic material when it emerges from the apertures at which those substances are expressed. W is another coil of strip metal or other sheet of material with which to further envelope and encase the article under manufacture. The bearings of these several coils are carried by springs and pressed up to stop rollers to maintain the delivery at a uniform height. When metal strip is applied it should be heated by gas jets or otherwise in order that it may

curve easily. It should, however, be partially cooled by a circulation of water just before it receives the coating of plastic material. X X are four rollers driven at an uniform rate of motion, the grooved peripheries of which form a circle and converge towards and embrace the manufactured rope to draw it through the several processes and thereby facilitate the manufacture.

Various combinations of materials may be thus effected and as exhibited, for example, in cross-sections at figures 9, 10, and 11.

Figure 9 represents several wires occupying the centre, which are severally coated and enveloped in sheet metal or other
39 material, which must be effected at a previous operation. The seven wires so prepared are introduced to the masticator chamber S at seven holes suitably disposed, and are coated and combined in one rope, which is further covered by concentric strips of metal or other material, as described and shewn at Fig. 9.

Fig. 10 shews a tube of metal and cementing materials in concentric lamina. The tube first introduced at S, if of flexible material, must pass through the expressing chamber on a core to sustain it until it acquires sufficient solidity and firmness to sustain the pressure of applying additional coatings.

Fig. 11 represents a transverse section of a laminated structure of flexible materials suitable for driving straps and other like articles. This may be produced in the machine Fig. 7 by forming a tube therein with an internal coating of cement. For this purpose the interior of the tube is produced by a sheet or strip of textile fabric previously coated with cement on its intended interior surface, which strip is delivered from core, as before shown, and entering
40 a volute mouth-piece, as at V, is carried through the plastic material on a core which resists the pressure of the expression chamber S. A sufficient number of layers having been applied, the tube is passed through a pair of rollers in lieu of four rollers, X X, which pair of rollers draw it through and at the same time press it into a flat band.

The tube being warm, the pressure of the rollers cause the internal coating of cement to adhere and remain a flat solid mass. The section Fig. 11 shews the tube as only partially collapsed and to more clearly exhibit the construction.

Tubing of gum muddar or gum muddar in suitable combination with caout*ouch*, a gutt*er*-percha, may be used in the manufacture of spinning roller covers or bosses in combination with concentric layers of sheet metal or textile fabrics or leather, as before described, and with an interior coating of cement for attaching the rollers, which are heated in order to effect the adhesion. Gutta-
41 percha or gum muddar in sheet, combined with layers of sheet metal, textile fabric, or leather, suitably cemented together, is adapted as a foundation or backing for carding or fine combing teeth. The foregoing cements are also useful for attaching the cards to their cylinders.

In witness whereof I, the said John Wallace Duncan, have here-

unto set my hand and seal this fourteenth day of October, one thousand eight hundred and fifty-three.

JOHN WALLACE DUNCAN. [L. S.]

Witness:
WILLIAM CLARK.

Ex'd: J. A. W.; M. McK.

44 DEFENDANT'S EXHIBIT BAUDOUIN PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1857. No. 933.

Specification of Felix Marie Baudouin.

Electric conductors, and machinery for the manufacture thereof.

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Electric Conductors and Machinery for the Manufacture Thereof.

Letters patent to Felix Marie Baudouin, of Paris, in the Empire of France, manufacturer, for the invention of "improvements in the wires or conductors of electric telegraphs, and in the machinery for the manufacture thereof."

Sealed the 23rd September 1857, and dated the 3rd April 1857.

Provisional specification left by the said Felix Marie Baudouin at the office of the commissioners of patents, with his petition, on the 3rd April 1857.

I, Felix Marie Baudouin, of Paris, in the Empire of France, manufacturer, do hereby declare the nature of the said invention for "improvements in the wires or conductors of electric telegraphs, and in the machinery for the manufacture thereof," to be as follows:

My invention relates to the preparation of conductors of electricity for electric telegraphs, being wires insulated to prevent the loss or deterioration of the electric currents used for that purpose, and also in the machinery for the preparation or manufacture of such conductors. I coat the wires with bituminous or such like fatty

matters that are not liable to become hard or crack, but, on the contrary, are constantly acted on by the temperature of the atmosphere. Coatings of this material in themselves are insufficient to maintain the proper protection and insulation for telegraph conductors, but when combined with other materials, such as paper, woven fabrics of cotton, silk, wool, or hemp, in a particular manner, are well adapted for the purpose.

The machinery constituting part of my present invention is adapted for the application of the textile material or paper with the bituminous matter to such conductors, whereby they are completely isolated, such isolation being of an enduring character and less liable to become defective than wires insulated in the ordinary manner.

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The machinery is of two kinds, one of which conducts the operation of lapping the ribbons or strips of paper or other suitable material round the coated wire, the wire having a motion of transmission in the direction of its length, and also a rotary motion for winding on the ribbons.

The wire is wound on a reel or drum, whose axis is placed in a frame mounted on an axis. The wire is conducted over suitable guide pullies through the spindle, and in a line with the axis of the rotating frame and thence to a drum in another similar rotating frame placed at a distance from the first. The latter drum has a motion to wind on the wire, while the first wire drum has a break to create sufficient tension on the wire in its being drawn off, thus a motion of rotation and transmission are simultaneously imparted to the wire.

The ribbons or reels containing the ribbons or strips of material to be wound on the wire are placed between the two rotating frames, with their axes placed at such an angle or incline to the wire, that as the wire rotates and traverses lengthways it winds upon it a helical coil from each bobbin whose edges are closely united, the position of the bobbin being regulated to insure their close contact. I prefer to use three ribbons and bobbins for this purpose, the first covering of the wire being enveloped by the second in such manner that the helical junction of the first ribbon is covered by the second, and the second by the third. The wire is passed through a bath of hot bitumen, and has the superfluous matter removed by passing through suitable dies or parts to scrape and smooth its surface, and render it of uniform thickness.

The first and second ribbons are also passed through bituminous or other suitable matter to render them more impervious to electricity. The coated and lapped wire is passed through suitable dies to remove superfluous matter, to smooth down the lapping of the ribbons, and to compress and cause their proper adhesion. The ribbon reels are furnished with breaks to produce sufficient tension of the ribbon. The ribbons may be applied without any bituminous coating, or they may be coated previously to winding on the supply bobbins.

In another arrangement of machinery according to my invention, I wind the wire to be coated on one wheel or drum and draw it off

by another. These drums have no rotary motion except on their own axes, the wire consequently has no motion other than in the direction of its length. In its passage from the one drum to the other it passes first through straightening rollers, then through a bath of hot bituminous matter, of which it receives a coating,
47 the excess being wiped and smoothed off by leather bushes or dies through which it passes. The coated wire now passes through the hollow axis of a rotating frame in which three ribbon bobbins are carried, disposed so that they lap three helical coils of the ribbon around the wire during its transmission through that frame, the disposition and effect produced being similar to that before described with the last machine. The coated and lapped wire passes through dies or smoothing holes both in entering and leaving the rotating frame; these dies or smoothers have rotary motion, the better to enable them to wipe and smooth the coated wire. The wires while under operation may either be disposed vertically or horizontally; and instead of one rotating frame with three or other number of ribbon bobbins, I sometimes use one frame for each ribbon. The wires before coating are properly cleaned, and in either method of coating may be straightened by passing between rollers both before and after the application of the coatings.

The apparatus before described may be used for coating wire with impermeable bands, treated with coatings of solutions of India rubber, mixtures of tallow and resin, and other insulating compositions; but of all others I prefer natural bitumen, such as the Bastennes bitumen, as, although they have the inconvenience of being affected by the temperature of the atmosphere, they may be varnished over with solutions of India rubber or gutta-percha, or other impervious matters.

In forming telegraph cables of wires covered, as described, I wind the wires on reels and place them in a rotating frame round its axis; from the reels the wires all converge to a point and pass out through the hollow axis of the frame, by whose motion they are twisted together, the twisted end of the combined wires being prevented rotating.

I also prepare telegraph conducting cables by tying the covered wires on a strong flat band of fibrous material well impregnated with bitumen, and also covering them with a band of strong or light material similarly treated. Instead of tying the wires on by riveting or sewing, I can weave the wire in the band or strap; I afterwards impregnate the strap thoroughly with bitumen, and, if necessary, further cover the wires by another band or strip of material on each side of the band in which the wires are placed, which strips are also bitumenized if desirable. I impregnate the warp threads with bitumen before weaving.

I further coat telegraph wires by strips or bands of woven or other suitable material lapped round them, the seam or joint being in the direction of its length, which I effect by drawing the wire through hot bitumen and through a draw plate with the covering
48 material, which is thereby lapped round and encloses the coated wire; two or more such coatings can be applied, in

which case I place the joints of the covering at opposite sides of the wire.

In laying down these telegraph bands or strips, which may or may not have been impregnated with bitumen, I first place in the bottom of the trench a thickness of bitumen, and above the conducting strap a second thickness of melted bitumen; I sometimes mix sand, gravel, or earthy matters with the bituminous mastics when embedding the wires in solid blocks of this substance in a plastic state. In order to protect telegraph conductors when used underground in towns where they are liable to the action of gas, which injuriously affects bituminous matters, I coat the bituminous blocks in which the covered wires are embedded with thickness of paper or metallic leaf, which is not easily penetrated by the gas. The paper for this purpose should be treated with insoluble soap, or some material to better enable it to resist the action of the gas. The metallic leaves should be soldered at the junctions to render it impermeable to the gas. If the lower part and sides of the bituminous bed be coated thus, it is some considerable protection, but it is better to be entirely enveloped. A coating of potters' clay or even of plaster assists in preserving the bitumen.

Specification in pursuance of the conditions of the letters patent, filed by the said Felix Marie Baudouin in the Great Seal Patent Office on the 3rd October 1857.

To all to whom these presents shall come, I, Felix Marie Baudouin, of Paris, in the Empire of France, manufacturer, send greeting:

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the third day of April, in the year of our Lord one thousand eight hundred and fifty-seven, in the twentieth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Felix Marie Baudouin, her special licence that I, the said Felix Marie Baudouin, my executors, administrators, and assigns, or such others as I, the said Felix Marie Baudouin, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the wires of conductors of electric tele-
49 graphs, and in the machinery for the manufacture thereof," upon the condition (amongst others) that I, the said Felix Marie Baudouin, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Felix Marie Baudouin, do hereby declare the nature of my said invention, and in what manner the

same is to be performed, to be particularly described and ascertained in and by the following statement reference being had to the two sheets of drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

My invention relates to a particular method of preparing the wires conducting the electricity for electric telegraphs for the purpose of insulating them, and thereby avoid loss and alteration of electric currents; and it also relates to the mechanism, by the aid of which such preparation and manufacture of these conductors is effected.

The elastic and impermeable substances ordinarily employed for covering the wire conductors of electricity for the purpose of insulating them generally present this serious inconvenience: on account of their elasticity they get out of form, and are easily impressed under greater or less pressure to which they may be submitted, particularly when they are at the same time subject to a sufficiently elevated temperature to soften them. Thus, under the influence of heat, copper wires covered with gutta-percha, simply by the effect of the alterations of the metal in expanding or contracting, make holes through such coverings and come in contact with the metal coverings, intended to protect them on the exterior, and thus destroy their insulation. To remedy this great inconvenience, I insulate telegraph wires by alternate coatings of insulating matters, and covering bands or tapes of textile fabrics which are themselves prepared with insulating matters, each layer being compressed, and the continuity of the same preserved throughout, the whole producing a body of such consistency and power of resistance to the alteration of form that the insulating materials do not of themselves possess.

Among the substances suitable for producing good insulating coatings are bitumens, which on account of their not being liable to change, and small cost, appear to me capable of being advantageously employed, either alone or in combination with other insulating matters of a more costly description, such as gutta-percha, India rubber, &c.

Bitumens, in fact, although they have the inconvenience of being influenced by heat, possess, on the other hand, the all-important property of being indefinitely preserved without alteration, while their softening by the action of heat is rendered immaterial by the interposition of the narrow bands of textile fabric with which I cover them, and which hold the thin layers of this substance placed between their coils or folds. Care must be taken not to confound pure bitumens, bitumens properly so called, such as good bitumens of Bastennes, for example, with tars and other analogous matters, which contain when mixed either a considerable quantity of volatile substances, the subsequent evaporation of which renders the coating friable, or even of water, and substances having an affinity for water, such as alkaline matters or acids, which may constantly compromise the insulating power of the coatings. I will further remark, that although I prefer bitumens for the coatings of telegraph wires, my process is equally ap-

plicable to all fatty or resinous substances possessing sufficient insulating power, for example, to gum-lac varnishes, fatty varnishes, solutions of India rubber, &c.

The mechanism I employ in order to effect the insulating coating of the conducting wires is of two kinds, the first, represented at figures 1 and 2, sheet 1, effects the operation of winding the ribbons or bands of woven fabric, paper, or other suitable material around the coated wire, the wire receiving a travelling or advancing motion in the direction of its length, and at the same time a rotary motion, in order to wind around it the ribbons or bands. This apparatus is arranged as follows: Figure 1, sheet 1, represents a plan of the apparatus; and figure 2, sheet 1, represents an elevation of the same.

(Here follow diagrams marked pp. 59 & 60.)

The wire to be covered is wound on a drum T, which I call the winding-off drum. This drum is carried by an axis, on which it can revolve, obeying the traction of the wire in being unwound. The motion of this drum is moderated by a sufficiently powerful friction brake, so that the wire may be kept in sufficient tension when being unrolled. The bearings in which the axis of the drum turns are carried by a frame B, which can itself take a rotary motion on its axis A, A, on which the frame is mounted, the direction of which is at right angles to that of the axis of the drum T. The axis A, A, one end of which is hollow, revolves in bearings C, C, mounted on uprights, as shewn. The wire unrolling from the drum T passes onto a grooved pulley P, intended to straighten it, and bring it in the direction of the hollow end of the axis A, through which it passes.

Opposite this first drum apparatus, and at a distance of about two or three yards, there is another drum apparatus, similarly arranged and disposed, with the exception of the following modifica-
51 tions, which arise from the fact that it is on this second drum T^1 that the wire has to be wound after its preparation. For this purpose, after the wire has received its insulating covering in the manner hereinafter explained, it passes through the hollow end of the axis A^1 of the second apparatus, thence over the groove of the pulley P^1, and onto the drum T^1, on which it is wound.

The drum frame B^1 carrying the drum T^1 itself revolves on its axis A^1, A^1. This rotary motion is imparted to it by a toothed wheel E^1, deriving its movement from any motive power, and on the same shaft another toothed wheel E imparts the same motion to the frame B, so that the whole system revolves round the line F, F^1, which is at the same time the axis of the part of the wire stretched between the two drum frames, and consequently the wire also receives a rotary motion with the whole system. At the same time as the wire revolves on its axis, and by reason of this motion, it also takes a traversing longitudinal movement from right to left, which is given to it by the following mechanism:—On the upright or support carrying the bearing C^1 of the left-hand frame a toothed wheel R is fixed, through which the hollow end of the axis A passes

and turns. This toothed wheel gears with another toothed wheel R^1, termed a satellite wheel, the axis of which turns in bearings fixed to the frame B^1, and it is controlled by this frame in its rotary motion around the hollow end of the axis A^1. In consequence of this arrangement, when the frame revolves on its axis, the satellite wheel which it controls cannot obey this motion otherwise than by itself taking a rotary motion around its own axis. The number of revolutions it thus makes on its axis at each revolution of the frame depends on the relative diameter of the said satellite wheel R^1 with that of the fixed wheel R with which it gears. At its opposite end the prolonged axis of the satellite wheel carries an endless screw V, which gears into a screw wheel R^{11}, concentric with the drum T^1, and rigidly connected therewith. Each revolution of the endless screw V causes one tooth of the wheel R^{11} to pass, and consequently causes the drum T^1 to perform the equivalent amount of revolution; for instance, if the wheel R^{11} has forty-eight teeth the drum T^1 will turn one forty-eighth part of a revolution on its axis.

It will be understood that in this manner at each revolution of the frame B^1, and consequently at each revolution of the wire, the drum T^1 on which the wire is wound (after it is covered) revolves a determined extent on its axis, and causes the wire F, F^1, to advance so much; thus the wire receives a double motion, one on its axis, and an advancing motion from right to left. But in order to assure the proper action of the apparatus, I have added other mechanism to regulate the winding of the wire on the drum T^1 according as it receives its covering.

52 It must be remarked, that the wire, after having passed over the groove of the pulley P^1, which is tangential to the direction of the axis of rotation of the hollow shaft A^1, through which it passes, should deviate in its direct course, in order to distribute the wire fairly on the drum; for example, if the winding-on is commenced on the side of the dum next the left flange, it should be guided gradually towards the right flange, come back to the left, return to the right, and so on, inclined a determined extent depending on the thickness of the covered wire so that the successive coils may be wound regularly till they have formed a first stage, covering the surface of the drum; they then form a second stage, being guided in the contrary direction, and then a third, &c., without which, the wire being always wound in the same place, the coils would be wound on without order, and would be liable to produce irregularity in the winding and working of the apparatus.

To conduct the winding, therefore, I have established a guide, to which the motion of the system itself imparts a to-and-fro motion, suitably calculated for the purpose.

The guide G, intended to conduct the wire, consists of a pulley, the groove of which is V-shaped; the arm carrying the guide pulley G is connected and forms one body with two bosses M, M, sliding with slight friction on two rods parallel to the axis of the drum T, and rigidly connected with the frame which carries the axis of the said drum. This arm carrying the guide is prolonged, and terminates at its other extremity in a fork carrying two rollers, between

which the thread of a cam is gripped; it is composed of two segments of screws H and H¹, uniting at their two extremities, and each of which comprises in its action the distance between the two cheeks or flanges of the drum T. This cam is carried on an axis parallel to that of the drum, and turns in two bearings fixed on the frame of the revolving machine. A toothed wheel is attached to this shaft, and is connected by a series of toothed wheels which receive motion from a pinion fixed on the drum T. These gearings are calculated to transform the rotary motion of the drum around its axis into slower rotary motion, so that if, for example, the covered wire with its covering inclusive be about one-third part of an inch in diameter, and if the distance between the flanges or cheeks of the drum be about ten inches, there would be room for winding thirty coils side by side on the drum; the toothed gearing should be so arranged that while the drum T makes thirty revolutions on its axis the screw cam H, H¹, may make half a revolution, or, what amounts to the same thing, while the drum makes sixty revolutions the screw cam makes one revolution on its axis. The cam is besides so arranged, that when the fork which it moves is at the left-hand angle, formed by the meeting of
53 the two half screws, forming the cam, the guide is in close relation with the left-hand flange or cheek of the drum, consequently every time that the drum turns on its axis and that a coil of wire is wound on the drum the cam accomplishes one-sixtieth of a revolution, and the wire is thereby traversed one-thirtieth of the breadth of its traverse, that is to say, the thirtieth part of ten inches, equal to the size of its diameter, or the necessary amount for placing a second coil in position; after thirty revolutions of the drum, and the winding on of thirty coils, the wire arrives at and touches the right cheek of the drum, at the same time that the fork guided by the movement of the first half of the cam arrives at the extremity of this first part, when the second half screw or part of the cam which makes an angle with the first, and is inclined in the inverse direction, acts by the continuation of the rotary motion and traverses the fork in the opposite direction, which it conducts from right to left, and in this manner the wire takes a gradual to-and-fro motion, which causes it to be wound with perfect regularity and in successive stages or layers on the drum T.

I would remark, that by means of the separation of the two frames having hollow axes, which carry the one the drum containing the naked wire, and the other the winding-on drum on which the wire is wound after it has received its covering, the space between these two revolving frames remains free and perfectly accessible to the attendant while they are performing their common rotation.

It is in this interval or space that the baths of melted bitumen or other substance are placed suitable for furnishing the coatings as well as the bobbins charged with coverings of textile fabric, the guides and smoothers for regulating the winding, the fire or gas burners serving to keep the bitumen and the various parts of the apparatus hot, without which the bitumen might become solid too soon.

Figures 1 and 2 show some of the detail arrangements of this part of the apparatus. As seen, there is in the direction of the length of the wire to be covered, and at a sufficient distance, a frame or bed, consisting of two hollow cast-iron girders Q, Q^1. This bed is hollow, so that a jet of steam can be passed through it in order to keep it hot. The various guides, smoothers, or other necessary parts may slide and be fixed by nuts between these two girders.

In front of this bed and under the wire to be covered a long box I, I, is hooked, filled with melted bitumen, and kept hot by fires or jets of ignited gas. J, J, other gas jets, made moveable by means of flexible tubes, which can be moved and conducted below all the parts which it may be necessary to heat.

54 A grooved pulley O of sufficient diameter turning on an axis supported by a moveable part D dips a sufficient distance into the bath of bitumen, and is in contact with the surface of the wire which causes it to revolve. This wheel thus keeps its periphery constantly loaded with hot bitumen.

Above the apparatus are suspended a sufficient number of reels K, K^1, K^2, K^3, of large diameter, on each of which a sufficient length of each of the tapes or ribbons serving to cover the wire is wound. These bobbins are furnished with brakes, so that the ribbons may be kept in sufficient tension while being wound on the wire, each of these tapes or ribbons b, b^1, &c., before passing on to the wire dips into the bath of bitumen passing between the two prongs of a horizontal fork f, which can be raised and lowered at the will of the operator by means of a slide made in the part D which carries it. The tape or ribbon on rising passes above a small cylinder c of polished iron, placed horizontally below the wire F, F^1, so that the said ribbon may be presented in a position inclined to the wire, and at any suitable angle, which is easily determined, as follows:—If x, Fig. 6, sheet 2, be the distance the wire advances each time it revolves on its axis and y its circumference, and if a right-angled triangle be formed having x and y for the sides containing the right angle, the angle formed by the hypotheneuse z and the side x will be that the ribbon should make with the axis of the wire. The hypotheneuse z will be the length of each coil, and the perpendicular w will be its width.

In order that the wire may not make a kink or twist when turning on its axis, but that, on the contrary, it may be wound well, according to the axis of the general rotary motion, and that the winding of the ribbon may be effected with regularity, I place supports g in front of and behind the point where the ribbon is wound, through which supports the wire to be covered passes; they are carried by slides which permit of their position being regulated exactly.

Independent of these guides, which act as smoothers, intended to throw off the excess of bitumen with which the covered wire may be loaded, I arrange one or several smoothers l, the function of which is to compress and regulate these successive coverings.

The parts which carry these various parts are arranged as indicated in the figures, so as to allow of their being moved from right

to left, and from front to back, and reciprocally, and even to allow of some of them, *f* and *c*, being placed at various angles.

By means of these arrangements I can cover the wire at one operation with as many coatings and insulating coverings as I wish. For which purpose it is sufficient to vary the number of pul-
55 lies which apply the bitumen, and of the bobbins carrying the supply of tapes or bands, and of the guides, smoothers, &c. I can also vary at will the nature of the coverings and also that of the coatings by having several different baths of coating material; I can also in certain cases use tapes, strips, or bands of impermeable tissue and paper, &c., instead of the tapes or bands of cloth. Among other combinations the following is a very efficient and cheap covering:—

First, a coating of bitumen on the surface of the wire.

Secondly, a covering of cotton, ribbon, or tape which has been dipped into the bitumen.

Thirdly, the application over this first ribbon covering the bitumen of a tape or narrow band of gummed taffetas or fine cotton, prepared in the same way as gummed taffetas.

Fourthly, a second covering of tape or ribbon permeated with bitumen.

Fifthly, a last covering of dry tape or ribbon, intended to absorb the excess of bitumen, and to obviate the viscosity it would present if it remained uncovered.

I can substitute for this last covering of dry ribbon a covering composed of strong threads of hemp or linen, or even narrow strips of card, in order to give greater solidity to this exterior protection. I can also substitute for this last covering of dry ribbon a narrow band of waxed cloth which has been well dried at a stove.

Experience has shewn me that the varnished cloth which covers the gummed taffetas, or the materials prepared in the same manner, cannot be attacked by the essential oils of gas tar, so much to be feared for the other coverings, therefore I think that in certain cases it would be well to double or even treble this covering of gummed stuff, care being taken to superpose on each a bituminous covering in order to cement them well together.

The same apparatus serves to obtain analogous results with other insulating preparations, such as preparations of India rubber, resin, gum lac, fatty oils, &c.

Figure 3, sheet 2, represents another arrangement of mechanism with which I can obtain the same results.

I first wind the wire to be covered round a pulley or a drum T, from which I unwind it by the aid of another drum T^1. These two drums revolve on their axes and remain in the same position; the wire F has consequently no other motion than its advance in the direction of its length. In its passage from one drum to the other it passes through straightening rollers l', then through a bath of hot bitumen I, I, or over the groove of a pulley dipping and re-
volving in the bath of hot bitumen, as before described, and
56 by this means receiving a coating, the excess of which is wiped off by scrapers or smoothers *l*, made of copper or other

elastic material, through which it passes. The wire being thus coated, then passes through the hollow end of the axis A of a revolving frame, which carries three bobbins charged with tapes or ribbons, and arranged so that in turning with the frame on which they are mounted they deposit three helicoidal turns of the tape or ribbon around the wire during its passage through the said revolving frame. The wire after being covered passes through other smoothers l^1, which, like the frame on which the bobbins are mounted, receive a rotary motion from any motive power. This arrangement produces a similar result to that obtained by the preceding mechanism.

This apparatus instead of being horizontal may be placed in a vertical position. Instead of having a single revolving frame carrying the three bobbins, I can employ a revolving frame for each bobbin, and multiply the number as much as may be required. These bobbins are besides furnished with friction brakes, in order to give sufficient tension to the ribbon. In this arrangement, as it is not the wire that turns, but, on the contrary, the bobbins charged with the covering ribbons or tapes, it is not possible to pass these ribbons into a bath of bitumen at the moment of covering the wire with them, but they may be coated previous to being wound on the bobbins.

The method of covering the wires which I have described, whether effected by one or the other of the above two descriptions of mechanism, may be advantageously applied to wires already covered with gutta-percha or India rubber, and it would have the result of completing and perfecting the insulation and of preventing deterioration of the currents of electricity.

According to my method of covering telegraph wires, the inner coating of gutta percha may be very thin, at the same time rendering it as continuous as possible, and by applying one or several alternate coverings of bitumen and impermeable tapes or bands, I not only completely obliterate the interstices or other defects which the gutta percha may present, but also make it less easily put out of shape, as these coverings of textile fabric hold it, and do not allow it to be so easily displaced.

The application of my process also furnishes another means of preventing damage being received by gutta percha coverings of wires. Gutta percha has the defect of not uniting well with the wire and not adhering to it; it is therefore more liable to be cut; but if a first covering of ribbon impregnated with bitumen, or other adhesive insulating matter, or a covering of linen, hempen, or cotton threads perfectly cemented be applied, first on the wire by the aid of a glutinous insulating coating, and if a layer of gutta
57 percha be placed over the wire thus previously furnished with a covering susceptible of being agglutinated when hot with the gutta percha, then the gutta percha, owing to the adhesion it will contract with this first insulating covering, which cannot be displaced, will be less easily damaged or put out of form even if pressed upon when it softens by high temperatures of the atmosphere; having besides its external surface held by the covering of

textile fabric with which it will be covered, it will present all desirable solidity and security. This combination, simple as it may appear, seems to me of importance. The wire being thus covered with insulating coverings, I can collect them in bundles and form them into long coils of cables, submitting them to a slight twisting by the ordinary means. For this purpose I have obtained a very good result from the mechanism represented at figures 4 & 5, sheet 2. In this mechanism I wind the covered wires on drums T, T, and place them in a frame B, revolving round its axis A, A^1. From these drums the wires all converge towards one point by means of guide rollers P, and go out through the hollow end of the axis A of the frame, by the motion of which they are twisted together. The twisted end of the wires collected together is held so as to prevent it from turning, and it is wound on a large winding or drum, which is put in motion by any motive power whatever, and exercises a sufficient drawing force on the cable at the same time that it winds it. I can besides, by the same means as before, cover the cable before rolling it on the winding-on roller with coats of bitumen and impermeable coverings, which will be another guarantee for their insulation.

Instead of arranging the groups of wire covered thus in round cables, I can give them when united the form of a flat cable or kind of strap, either by attaching the covered wires on strong flat bands of textile or fibrous matters well impregnated with bitumen, or by weaving them with strong hempen or other threads previously prepared and impregnated with bitumen, so as to form an open work band in the chain or warp of which the conducting wires are placed; I then impregnate these kinds of bands or flat cables with bitumen, and cover them either on one side or on both sides, if necessary, with bands also impregnated with bitumen.

When these bundles of covered wires are to be placed underground, whether they are in the form of round or flat cables, I either simply lay them in the trenches, coating them at the same time with hot bitumen, or I bury them in a long block or a sort of girder of bituminous mastic, with which I incorporate, for greater solidity and economy, sand, gravel, or other earthy matters, taking care that such matters are in a very dry state. For this purpose I first apply to the bottom of the trench a thickness of bituminous mastic,
58 and above the round or flat cable I run a sufficient thickness of this same mastic to unite with the first and surround the conducting cable on all sides.

For telegraphic conductors placed underground in towns and exposed to the action of gas used for lighting purposes, which affects more or less most insulating matters, and particularly bituminous matters, in a pernicious manner, I cover the last covering of these cables, or the bituminous blocks in which the wires are buried, with a covering of paper or sheet of metal, which is not easily penetrated by the gas. Paper used for this purpose should be treated with a solution of sulphate of copper, or of a silicate, then with insoluble soap, or any other preparation best capable of resisting not only the action of gas, but any alteration which might result from humidity.

The sheets of metal are soldered at their junctions to render them impermeable to gas.

If the bottom and sides of the bed of bitumen are thus covered it may be a sufficient protection, but it is better to cover it altogether. In some cases a covering of potters' clay, plaster, or other plastic substance may also contribute to preserve the block of bitumen. This means of preservation from the dissolving action of gas applied to the external covering of the wires is independent of that resulting for each wire from the presence of gummed taffetas or gummed cotton tissue, which I include, as above mentioned, in the composition of the insulating coating of each of these wires, and which I could also use for the exterior covering of my cables, and the bituminous blocks in which I may enclose them.

Having described the nature of my invention, and the manner of performing the same, I declare that what I claim as my invention, intended to be protected by the hereinbefore in part recited letters patent, is,—

First, the insulation of the wires or conductors of electricity by the application of insulating coatings or coverings, consisting of tapes or ribbons of tissue of textile or thread material themselves, either previously impregnated or not with insulating matters, applied alternately with layers of insulating matters, as hereinbefore described.

Secondly, the use and application of the apparatus or combination of parts represented at figures 1 and 2, sheet 1, for the purpose of covering and insulating the wires or conductors of electric telegraphs, as hereinbefore described.

Thirdly, the use and application of the apparatus or combination of parts represented at figure 3, sheet 2, for the purpose of covering and insulating the wires or conductors of electric telegraphs, as hereinbefore described.

Fourthly, the combination of this particular method of covering telegraph wires or conductors with the means heretofore
61 adopted for their insulation, and particularly with coverings of gutta percha or of India-rubber, either by first covering the wire with a case of gutta percha, for example, and applying thereon coverings of the kind hereinbefore described; or, on the contrary, by first applying the covering on the wire and then applying the gutta percha or India-rubber coating, as described.

Fifthly, the manner of congregating and forming the wires covered as hereinbefore described into the form of round cables, to which cables the same mode of covering may be applied.

Sixthly, arranging and uniting the wires covered as hereinbefore described in the form of flat cables or straps, either by attaching them on to flat impermeable bands, or by weaving them with hempen threads which may previously be rendered impermeable to electricity, the said flat cables or straps can be doubled or covered above and below by thicknesses of tissue, also rendered impermeable to electricity.

Seventhly, the modes herein described of insulating and embedding a congregation of wires intended to form a telegraphic con-

ductor when embedded underground, particularly by placing them in long blocks of bituminous matter.

Eighthly, the means hereinbefore described of preserving telegraphic conductors thus placed underground from the destructive effects of gases used for lighting purposes, by surrounding them with coverings which are not attacked by gases or the essential oils thereof.

In witness whereof, I, Felix Marie Baudouin, have hereunto set my hand and seal, this first day of October, in the year of our Lord one thousand eight hundred and fifty-seven.

F. M. BAUDOIN. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1857.

62 DEFENDANT'S EXHIBIT HORSTMAN PATENT. F. C. E., N. P. March 17, 1886.

THE ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1859, 16th February. No. 434.

Specification of William H. Horstmann.

Telegraphic cables, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty; published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1859. Price 10*d*.

63 [British coat of arms.]

A. D. 1859, 16th February. No. 434.

Telegraphic Cables, &c.

Letters patent to William H. Horstmann, of the city of New York, in the county of New York, and in the State of New York, U. S. A., for the invention of "telegraphic cables, and the mode of constructing the same, and laying them down."

Sealed the 10th June 1859, and dated the 16th February 1859.

Provisional specification left by the said William H. Horstmann at the office of the Commissioners of Patents, with his petition, on the 16th February 1859.

I, William H. Horstmann, of the city of New York, in the county of New York, and the State of New York, U. S. A., do hereby de-

clare the nature of the invention for "telegraphic cables, and the mode of constructing the same, and laying them down," to be as follows:—

This invention has for its object improvements in telegraphic cables, and in the mode of constructing and laying the same. For this purpose, I take a wire of copper or other good conductor of electricity wound on spools, reeled or otherwise coiled in a way that will admit of being readily removed. I convey this wire through an apparatus containing gum lac, dissolved in a pure state or mixed with turpentine or other resinous material that will serve to make it more elastic.

The apparatus I employ is a reservoir or kettle, made double and heated by steam; this reservoir is hung on trunnions or lugs, so as not to be canted by the rolling of the vessel. At the axis of this reservoir, the wire above named is made to pass through a casing surmounted by a hopper, which feeds the coating material to the wire as it is drawn through, and is itself supplied from the reservoir above. The wire after passing from the first, runs through a second similar apparatus filled with rosin, mixed with sufficient tar to make it pliable, or with a similar compound of the resinous gums. This is followed by a coating of mislin tape, paper, or other fibrous material, or gutta percha or India-rubber; and it is then passed through a wrapping guide apparatus, which wraps this material around the wire; the operation being completed by a spring fork above; a second coating of the resinous compound and a second tape may then be added, or more, if found advisable; after which the wire is joined with a second, similarly coated, and the two are bound together by a yarn, wound from a bobbin or spool around them, in a manner similar to that used to cover bonnet wire. Afterwards, a second bobbin lays a yarn in the opposite direction, crossing the first.

This partly formed cable of conductors, now passes over a spool of stout iron wire, which has a check brake apparatus combined with it, and is intended to bear the strain of the cable while being laid. It is bound to the first-named wires by similar bobbins winding yarns around all just beyond the point of their union, each succeeding spool or bobbin winding in an opposite direction. At a little distance from this first iron wire junction, there may be a second similar iron wire apparatus to supply the place of the first in case of accident or if a second wire is found necessary in case of rough weather or very deep soundings. The cable is now conveyed overboard either at the stern or other proper point for delivery.

In passing overboard, the cable enters a kettle of melted tar and rosin compound, down through the bottom of which it passes, there being an elastic mouth opening there that prevents any more of the compound being drawn through the bottom than is necessary, and the cable is thence delivered into the water. The opening in the bottom of the kettle is governed by a rope, which is made to tighten the mouthpiece. The kettle is double, and heated by steam.

After the cable has passed this last process, it receives upon it at

proper intervals, certain buoys or floats that serve to support it and allow it to sink more gradually and with less strain than would otherwise be the case; suspending it in festoons or curves from float to float, and then gradually descending to its bed and allowing the inequalities of the surface on which the cable finally rests, to take up the curves without any chance of breaking the cable.

The floating supports are made as follows:—There is a flat
65 hook that is hooked on the cable, saturated with pitch so as to adhere thereto. This hook is suspended from the centre of the float (which is a plain flat board) by a cord; the cord is brought to the end of the float, and there fastened by a loop of ribbon or tape, the tape being affixed to the board by wafers or glue, that will dissolve quickly in water. In this condition, the float is launched with the cable, and for a time descends with it endways; but when the tape becomes detached and sets the cord free from the end of the float, the board becomes a powerful resistant to the rapid descent of the cable. These floats, placed a mile more or less apart, will greatly relieve the strain of the cable upon the vessel.

In order to connect the several coils of wire, I employ a link, having at each end a hole, through which the strand of wire is put and upset, so as to form a head. This strand end and link are brought to the axis of motion while the spool of wire is revolving, and serve as a swivel to prevent a twist in the wire. By this means, all the spools may be unwound in succession in one continuous line, without any stoppage. This is necessary in manufacturing the cable as it is being laid. The wire heads, as well as the holes in the link are wedge-shaped or conical; this insures the most perfect contact of the parts.

Specification in pursuance of the conditions of the letters patent, filed by the said William H. Horstmann in the Great Seal Patent Office on the 16th August, 1859.

To all to whom these presents shall come, I, William H. Horstmann, of the city of New York, in the county of New York, and the State of New York, U. S. A., send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the sixteenth day of February, in the year of our Lord one thousand eight hundred and fifty-nine, in the twenty-second year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said William H. Horstmann, her special licence that I, the said William H. Horstmann, my executors, administrators, and assigns, or such others as I, the said William H. Horstmann, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an in-
66 vention for "telegraphic cables, and the mode of constructing the same and laying them down," upon the condition

(amongst others) that I, the said William H. Horstmann, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said William H. Horstmann, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, referring to the accompanying drawings:

(Here follow diagrams marked pp. 69 & 70.)

in which Fig. 1 is a general outline of the arrangement and disposition of the apparatus on board a ship when the cable is to be submerged; Fig. 2 is a vertical section of a reservoir, enlarged; Fig. 3 is a mode of splicing the conducting wires or supporting wires; Fig. 4, float for cable; Fig. 6, cable.

My invention consists, first, in the mode of coating and combining the conducting wires so as to render the insulation perfect; and also diminishing the danger of fracturing the conducting wires. To effect this object, I cover the conducting wire after it has passed through a process of brightening on its surface with a coating of gum lac, which may be repeated, if found necessary; and then I coat the wire outside the covering of gum lac with cloth or other fibrous material. I then submit the wire thus coated to a process of coating with some sufficient pitchy compound or resinous compound, preferring for this purpose a mixture of rosin and tar, or asphaltum and turpentine, to make a sufficiently elastic compound. After this, an additional covering of fibrous material should be put on; and if more than one conducting wire is used, they should be united and bound together by winding a thread of fibrous material around them. After which, stout iron wire of strength sufficient to support the cable must be added, keeping it in a straight line and at its full tension. This is also coated with the resinous compound in a melted state, and bound to the rest by means of fibrous cord wound around the whole. For certain purposes, such as the shore ends of the cable, when used for submerging in the ocean, &c., more than one iron protecting wire is employed and the conductor may be entirely surrounded by these protecting wires, which in all instances must be made straight and parallel, so as to take the full strain from off the conductors.

My second improvement is in the new mode of constructing the cable while being laid. To effect this I take a wire of copper,
67 or other good conductor of electricity, wound on spools reeled or otherwise coiled in a way that will admit of being readily removed. This is shown in the drawing at *a*, *a*. From thence I pass the wire through a series of sand paper or other proper scourers and leather polishers at *b*, by which the oxydized surface is

removed and the bright metallic wire thus cleansed is passed along the junction of two inclined planes at *c*, down which the dissolved gum lac is caused to flow, and thus coat the wire perfectly. After passing the coating apparatus the wire is drawn through the center of a heated cylinder or oven c^1, when it is equalized somewhat, and then passes between two rollers at c^2, where it receives a covering of cloth or other proper fibrous material; the rollers being grooved to receive the coated wire wrap the fibrous material closely around the wire, when it adheres to the gum lac coating. (The rough edges of this fibrous covering are laid down with the next coating of pitch, rosin, or other material applied as hereafter described.) I convey the wire through the apparatus at *c*, containing gum lac dissolved in a pure state, or mixed with turpentine or other resinous material that will serve to make it more elastic. The construction which I propose as the best for the reservoirs for the gum lac, pitch, or rosin composition, hereafter described, is as follows:—I have a reservoir or kettle (see Fig. 2) which if it is to be heated is made double, and is heated by steam. This reservoir is hung on trunnions or lugs, so as not to be canted by the rolling of the vessel. At the axis of this reservoir the wire above named is made to pass through a casing, surmounted by a double-inclined table or a hopper, which feeds the coating material to the wire as it is drawn through, and is itself supplied from the reservoir. The wire then runs through an apparatus at *d*, filled with rosin mixed with sufficient tar to make it pliable, or with a similar compound of the resinous gums. This is preceded by a coating of muslin tape, paper, or other fibrous material, or gutta percha, or India-rubber, and it is then passed through a wrapping guide apparatus like the former, or as seen at *e*, which wraps this material around the wire; the operation being completed by a spring fork *f* above, a second coating of the resinous compound and another tape may then be added, or more if found advisable; after which the wire conductor is joined with a second similarly coated, and the two are bound together by a yarn wound from a bobbin or spool around them, in a manner similar to that used to cover bonnet wire. This is done at *g*. At *h* a second bobbin lays a yarn in the opposite direction crossing the first. I give no particular description of this apparatus for covering wire, as it is one well known. This incipient cable of conductors now passes over a spool of stout iron wire which joins it at the point *x*. This iron wire has a check brake apparatus
68 combined with it, and is intended to bear the strain of the cable while being laid. It is bound to the first-named wires by similar bobbins winding yarns around all just beyond the point of their union, as clearly seen in the drawing at *i*, *i*, *i*, each succeeding spool or bobbin winding in an opposite direction to the preceding one. At a little distance from this first iron wire junction, there may be a second similar iron wire apparatus, to supply the place of the first in case of accident, or if an additional wire is found necessary, in case of rough weather, or very deep soundings, &c.; after which the cable is conveyed overboard, either at the stern, as shown in the drawing, or at the side at the most suitable point

of delivery. In passing over the side or stern the cable enters a kettle of melted tar and rosin compound at *m*, down through the bottom of which it passes, as clearly shown in figure 1, there being an elastic mouthed opening there that prevents any more of the compound being drawn through the bottom than is necessary, and the cable is then delivered into the water. The opening in the bottom of the last-named kettle *m* is governed by a rope *o*, which is made to tighten the mouthpiece. The kettle is double, and heated by steam. In order to connect the several coils of wire I employ a link *r*, (shown in Fig. 3), having at each end a hole, through which the strand of wire is put, and upset so as to form a head as at *s*. This strand end and link are brought to the axis of motion while the spool of wire is revolving, and serve as a swivel to prevent a twist in the wire. By this means all the spools may be unwound in succession in one continuous line without any stoppage. This is necessary in manufacturing the cable as it is being laid. It will be noticed that the wire heads are wedge-shaped or conical as well as the holes in the link. This insures the most perfect contact of the parts. Another modification of this is shown in Fig. 5, in which *a* is the link, having one wire soldered thereto; the other wire *c* is inserted into a recess in this link through a slit in a surrounding tube *b*, which is then turned so as to remove the slit from opposite the recess in the link, and thus enclose and fasten the wire *c*. After the cable has passed this last coating process it receives upon it at proper intervals certain buoys or floats *q* that serve to support it and allow it to sink more gradually and with less strain than would otherwise be the case, suspending it in festoons or curves from float to float, and then gradually descending to its bed, and allowing the inequalities of the surface on which the cable finally rests to take up the curves without any chance of breaking the cable. The floating supports *q* are made as follows:—There is a flat hook q^1 that is hooked to the cable, filled with pitch, so as to adhere thereto. This hook is suspended to the centre of the float *q* by a cord q^2, the float being a plain flat board. The cord
71 q^2 is brought to the end of the float, and there fastened by a loop of ribbon or tape, the tape being affixed to the board by wafers or glue that will dissolve quickly in water. In this condition the float is launched with the cable, and for a time descends with it endways, but as the tape loosens, the cord q^2 is freed, and then the board becomes a powerful resistant to the rapid descent of the cable. These floats, placed a mile more or less apart, will greatly relieve he strain of the cable on the vessel.

Having thus fully described my improved construction of cable, what I claim therein as new, and for which I desire letters patent, is the cable made by covering the conductors separately with gum lac, fibrous material, &c., and combined with one or more iron protecting wire or wires, substantially as and for the purposes set forth.

I also claim constructing the cable by the apparatus substantially as herein described, consisting of the reservoirs, wrapping apparatus, &c., or their equivalents, as specified.

I also claim the final reservoir *m* for coating a telegraphic cable

after it has passed all the other apparatus and before it has entered the water or ground, constructed and applied substantially as herein specified.

I also claim the manufacturing of the cable at the time it is laid, so as to perfect it, and at once to launch it into the place where it is to remain, whereby I avoid all the chances for injuring and imperfections arising therefrom growing out of stowing and handling the cable after it has been made as heretofore has been done.

I also claim the employment of the swivel link for connecting the several spools or bobbins of telegraphic wire as specified.

I also claim the floats q with their appendages substantially as and for the purposes set forth.

In witness whereof, I have hereunto set my hand and seal, this 14th April 1859.

WILLIAM H. HORSTMANN. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1859.

72 DEFENDANT'S EXHIBIT SIEMENS PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1863, 20th February. No. 464.

Specification of Charles William Siemens.

Insulating and supporting telegraph wires.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1863. Price, 1*s.*

73 [British coat of arms.]

A. D. 1863, 20th February. No. 464.

Insulating and Supporting Telegraph Wires.

Letters patent to Charles William Siemens, of No. 3, Great George street, Westminster, in the county of Middlesex, for the invention of "improvements in insulating and supporting telegraph line wires."

Sealed the 15th August 1863, and dated the 20th February 1863.

Provisional specification left by the said Charles William Siemens at the office of the commissioners of patents, with his petition, on the 20th February 1863.

I, Charles William Siemens, of No. 3, Great George street, Westminster, in the county of Middlesex, do hereby declare the nature of the said invention for "improvements in insulating and supporting telegraph line wires," to be as follows :—

Telegraph line wire is sometimes covered throughout its length with an insulating material, and at other times the uncovered wire is suspended in the air from poles, with insulating supports for the wire attached to the same; in the latter case the atmospheric air is the insulating medium surrounding the conductor.

In forming a continuous insulating covering upon a conducting wire, I employ the natural juice or milk extracted from the India-rubber or gutta percha trees, or varieties of the same. For this purpose I send out to the countries where these trees abound metallic or other vessels capable of being sealed hermetically; these
74 vessels being attached to the tree receive the juice therefrom through a connecting tube, as far as practicable under exclusion from contact with the surrounding atmosphere. These vessels, when filled with juice, are hermetically closed by means of a screw stopper or otherwise, and are then shipped to this country. I prefer to give to these vessels a rectangular prismatic form, with a screw stopper at one end for convenience of stowage.

In effecting insulating coverings by means of these juices, which will be found to remain entirely liquid in the sealed vessels, I prefer to proceed in the following manner:—I cover the wire first with a layer of silk, cotton, or other fibrous material in the usual way; the wire thus covered is passed through or soaked in a bath of the juice, and rising slowly from the bath, it passes through an air flue or shaft of very considerable height, which is maintained at a temperature of from 100 to 300 degrees Faht. either by external application of heat or by a continuous supply of heated air from a stove. Under the influence of the heated air, the film of juice adhering to the wire becomes rapidly dried and consolidated. Passing over a pulley at the top of the heated air shaft, the wire descends, passes at the bottom over another pulley immersed in the juice, and again ascends through the same or another air shaft. In this manner the wire may receive any number of thin coats of India-rubber or gutta percha, or of both materials combined. At intervals the wire may be passed with advantage through a solution of shellac, or colodion, or other insulating substance. The covered wire may also receive at intervals additional coats of fibrous material or of other insulating material, such as India-rubber or gutta percha put on by any of the known processes. It is not necessary to provide the wire in the first instance with a covering of fibrous material, although I prefer to do so generally. In order to increase the thickness of each covering film of India-rubber or gutta percha, I sometimes subject the natural juice, previous to its application, to a process of evaporation. This is best effected by gentle application of heat under the influence of a partial vacuum.

In suspending telegraphic line wire in the air, I prefer to use an insulator consisting of an inverted bell of porcelain or hardened India-rubber, which is cemented into an inverted cup of cast iron to protect the same against rain and injury. A stalk of steel or iron with enamelled surface is cemented into the insulating inverted cup, being turned up at the end, or provided with other means of fastening or supporting the line wire. The cast-iron protecting cup has an arm terminating in a socket, the axis of which is parallel to that of the cup, and which is slipped over the post or main support. Two insulators may be united to the same socket to support a wire on either side of the post. A set screw or key may be employed for fastening or steadying the socket on the post.

The posts hitherto most employed are of wood and iron, structures with or without wood tops have frequently been used. The wooden posts do not afford a permanent support to the insulated wire, being subject to decay, and the iron posts hitherto employed are very costly and difficult to transport. In order to meet these difficulties, I construct telegraph posts, by preference, of three parts to be carried separately, and to be put together on the spot. The part of the post which is buried in the ground I prefer to construct of a dished plate of wrought iron, combining lightness with rigidity in a remarkable degree. A cast-iron pipe is fixed by bolts or otherwise to this foot plate at or near the middle, which pipe rises considerably above the ground line, and terminates in a socket to receive the upper portion of the post, which consists of a conical tube of wrought iron welded together longitudinally, combining strength with lightness and compactness in a high degree. This tube is fastened in the socket by means of wedges, and by pouring in a cement consisting, by preference, of sulphur with an admixture of oxide of zinc or other metallic oxide. The wrought-iron tube may be surmounted by a metallic rod for the discharge of atmospheric electricity into the ground. Both the lightening discharger and the stalk of one or more insulators may be dropped side by side into the top of the wrought-iron conical tube, and secured by a wedge, or in any other suitable manner. Each of the three essential parts composing this post is of such moderate size and weight as to admit of convenient transport, which is of great importance in constructing telegraph lines through uncultivated countries. Each part of this post may be varied in form; instead of a dished plate a straight plate of increased thickness and weight may be used to form the foot, or a heavier cast-iron plate may be used, or a plank or cross of timber, or a block of stone may be employed in its stead. The lower cast-iron portion of the post may be made cylindrical or slightly conical, diminishing upwards. It is obvious that the foot plate may be cast in one piece with the lower part of the post, but this arrangement could only be applied where no difficulties of transport would arise, and, under any circumstances, I much prefer making the same a separate piece.

Instead of a conical welded wrought-iron tube to form the upper portion of the post, a cylindrical wrought-iron tube may be used; but I decidedly prefer to employ a tapering tube, diminishing up-

wards in such a ratio as approximately to constitute a lever of equal strength at every point. The hollow space within the tube may be filled with sand, earth, or cement, or the wrought-iron tube
76 forming the upper part may be rolled or drawn with and upon a core of sand, which in the process of rolling or drawing will consolidate in consequence of the heat of the furnace employed, thus forming a solid core.

Specification in pursuance of the conditions of the letters patent, filed by the said Charles William Siemens in the Great Seal Patent Office on the 19th August 1863.

To all to whom these presents shall come, I, Charles William Siemens, of No. 3, Great George street, Westminster, in the county of Middlesex, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twentieth day of February in the year of our Lord one thousand eight hundred and sixty-three, in the twenty-sixth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Charles William Siemens, her special licence that I, the said Charles William Siemens, my executors, administrators, and assigns, or such others as I, the said Charles William Siemens, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in insulating and supporting telegraph line wires," upon the condition (amongst others) that I, the said Charles William Siemens, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Charles William Siemens, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the accompanying drawing, and to the figures and letters marked thereon (that is to say):

(Here follows diagram marked p. 82.)

This invention consists of improvements in insulating and supporting telegraph line wires. Telegraph line wire is sometimes covered throughout its length with an insulating material,
77 and at other times is suspended in the air from poles with insulating supports for the wire attached to the same; in the

latter case the atmospheric air is the insulating medium surrounding the conductor.

In forming a continuous insulating covering upon a conducting wire, I employ the juice or milk extracted from the India-rubber or gutta percha trees or varieties of the same. For this purpose I send out to the countries where these trees abound metallic or other vessels capable of being hermetically sealed; these vessels being attached to the tree receive the juice therefrom through a connecting tube, as far as is practicable under exclusion from contact with the surrounding air. These vessels, when filled with juice, are hermetically closed by means of a screw stopper or otherwise, and are then shipped to this country. I prefer to give to these vessels a rectangular prismatic form with a screw stopper at one end for convenience of stowage.

In effecting insulating coverings by means of these juices, which will be found to remain entirely liquid in the sealed vessels, I prefer to proceed in the following manner:—I cover the naked wire or strand of wires first with a layer of silk, cotton, or other fibrous material in the usual way; the wire thus covered is passed through or soaked in a bath of the juice, and is slowly raised from the same, and drawn up through an air flue or shaft of considerable height which is maintained at a temperature of from 100° to 300° Fahrenheit, either by the external application of heat, or by a continuous supply of heated air from a stove. An arrangement for this purpose is shewn at figures 1 to 3 on the accompanying drawing.

Figure 1 shews a transverse section of the same on line X, X, figure 2; figure 2 shews a longitudinal section on line Y, Y, figure 1; figure 3 shews a sectional plan on line Z, Z, figure 2. The same letters of reference indicate the same parts in each of the figures.

A is a broad brick shaft with the hot-air flues B, B^1, on each side; C, C^1, are two stoves for heating the same; a series of pulleys D is placed on an axle at the top of the shaft, and a second series, is so arranged at the bottom that the pullies can be submerged in a bath E, containing the juice of the India-rubber or gutta percha tree, or each pulley may be placed in a separate bath. The wire is lead into the shaft over the guide pulley *d*, and dips immediately into the bath E, by which it becomes covered with juice; it then rises up the shaft A, where, under the influence of the heated air, the film of juice adhering to the covering of the wire on leaving the bath becomes rapidly consolidated and dry. The wire is passed over one of the top pulleys and down again into the bath, by which it receives a second film of juice, which dries in the same way, as the wire again passes up the shaft, and so on, till the wire
78 has got a sufficient number of coatings, when it passes away over the pulley d^1. Instead of one large bath of India-rubber juice or gutta percha juice alone, these two substances may be mixed with advantage, or a number of small baths containing alternately gutta percha and India-rubber juice may be substituted, so that the wire would receive alternate coatings of these substances. After being coated with a series of films of one or both of these juices, the wire might be spun over with a coating or coatings of

fibrous material, or covered with insulating material, such as India-rubber or gutta percha, by any of the already known and applied means. It is not absolutely necessary to provide the wire in the first instance with a covering of fibrous materials, but I prefer to do so.

In covering a strand of wire with the juices I sometimes previously lay threads of fibrous material helically between the wires composing the strand. I have also applied with advantage the above-described means of coating with India-rubber or gutta percha juice in the manufacture of hempen or other cables for submarine telegraph lines. For this purpose I pass the core after it has been spun once round with hemp or other fibrous material in one direction through a bath of India-rubber or gutta percha juice, and I then spin the second layer of hemp or other fibrous material in the reverse direction before the juice has become consolidated and dry, or I let a stream of the juice pass upon the wire when once covered and before the second covering is applied. The saturated fibrous covering of great tenacity so formed may then, before the juice has had time to dry, with advantage be covered with a metallic laminous sheathing, as described in the specification to certain letters atent granted to me and bearing date the 9th of January 1862 No. 59), after which the cable so formed must be exposed for some ime to atmospheric influence, in order that the India-rubber or utta percha juice may become perfectly consolidated or indurated. n order to increase the thickness of the single films of India-rubber r gutta percha, I sometimes subject the juice to a process of evapoation. This is best effected by the application of a moderate heat nder a partial vacuum.

In suspending telegraph line wires in the air I prefer to use an sulator consisting of an inverted bell of porcelain or hardened lia-rubber or ebonite, which is cemented into an inverted cup of iron to protect the same from rain and injury, which cup may ither painted, galvanized, or enamelled. An iron or steel stalk, surface of which is either enamelled or covered with ebonite or rnified India-rubber as far as it will be exposed to the atmosphere, is cemented into the inverted insulating cup and turned up at the lower end, or provided with other means for supporting or 79 fixing the line wire. The cast-iron protecting cup is furnished with an arm terminating in a socket, the axis of which is parallel to that of the cup, and which is slipped over the post or main support; or in place of a socket I form a curved flange at the end of the arm, fitting partly round the post, against which it is firmly secured by means of a horseshoe strap passing over it and through an iron saddle on the opposite side of the post, where it is screwed up, as shewn in section and plan at figures 10 and 11, where F is the inverted bell of porcelain or hardened India-rubber; H, the inverted cup of cast iron; I, the enamelled stalk; J, the arm; J^1, the flange to the same; K, the strap; and L, the saddle piece.

Two such insulators may be formed on the same bracket to support a wire on each side of the post, as is shewn at M in Figures 4 to 7. In this case either a set screw *m* or a wedge may be employed

for fastening or steadying the bracket on the post. The posts mostly hitherto employed have been of wood, and iron structures with or without wooden tops have also frequently been used. The wooden posts do not afford a durable support to the insulated wire as they are subject to decay, and the iron posts hitherto employed are very costly and difficult to transport. In order to meet these difficulties I construct telegraph posts of three parts, to be carried separately and put together on the spot. The part of the post which is buried in the ground I prefer to construct of a dished plate of wrought iron, combining lightness with rigidity in a remarkable degree. A cast-iron pipe is fixed by bolts or otherwise to this foot plate at or near the middle, which pipe rises considerably above the ground line and terminates in a socket to receive the upper portion of the post, which consists of a conical tube of wrought iron welded together longitudinally, combining strength with lightness and compactness in a high degree. This tube is fastened in the socket by pouring in a cement consisting by preference of sulphur with an admixture of oxide of zinc or other metallic oxide. The wrought-iron tube may be surmounted by a metallic rod for the discharge of atmospheric electricity into the ground. Both the lightning discharger and the stalk of one or more insulators may be dropped side by side into the top of the wrought iron conical tube, and be secured by a wedge or in any other suitable manner. Each of the three essential parts composing this post is of such moderate size and weight as to admit of convenient transport, which is of great importance in constructing telegraph lines through uncultivated countries.

Figures 4 and 5 shew a sectional elevation and a plan of this construction of telegraph posts. N is the dished plate; O is the cast-iron socket attached thereto, and P is the conical wrought-iron
80 tube; Q is the lightning conductor formed with a loop at the top, through which a wire passes connecting all the posts with each other, so as to discharge simultaneously through all the posts.

I also employ some modifications of the same principle of construction; figures 6 and 7 shew a sectional elevation and a plan of one of these modifications, in which I employ as before a dished or buckled plate of wrought iron N, but instead of bolting this immediately to the foot of the tube I bolt it to the flange of a cylindrical cast-iron socket R, into which I cement the lower end of a cylindrical wrought-iron tube O^1. Inside the latter, near the upper end, I rivet an inverted iron cup *o*. The upper tube P I make, as before, conical and of wrought iron; its lower end rests on the bottom of the iron cup *o*. I pass a cast-iron collar or boss *p* over the upper or conical tube, and press it down by hammering or otherwise until it rests on the top edge of the lower tube. The joint is then completed by pouring fluid cement through a hole in the collar.

A second modification, shewn in part sectional elevation and plan at figures 8 and 9, consists in connecting the tube O^1 to the foot plate N, by means of a cast-iron collar S bolted on to the latter, the bottom of the wrought-iron tube being hammered outwards so as to form a flange upon which the collar presses.

Each part of this post may be further varied in form. Instead of a dished plate a straight wrought-iron plate of increased thickness and weight may be used to form the foot, or a heavier cast-iron plate may be employed, or a plank or cross of wood or a block of stone may be made use of in its stead. But I generally prefer the arrangement as shewn, on account of its combining lightness with rigidity in the highest degree. The lower cast-iron portion of the post may be made cylindrical or slightly conical, diminishing upwards. Instead of a conical welded wrought-iron tube to form the upper portion of the post, a cylindrical wrought-iron tube may be used, but I decidedly prefer to employ a tapering tube, diminishing upwards in such a ratio as approximately to constitute a lever of equal strength at every point. The hollow space within the tube may be filled up with sand, earth, or cement, or the wrought-iron tube forming the upper part may be rolled or drawn with and upon a core of sand, which, in the process of rolling or drawing, will consolidate in consequence of the heat of the furnace employed, thus forming a solid core.

Having now described the nature of this invention, and the best means I am acquainted with of performing the same, I wish it to be understood that what I claim is,—

Firstly, the employment of the juice or milk of the India-rubber and gutta percha trees, and varieties of the same for coating electric telegraph line wires or cables.

Secondly, effecting one or more coats of India-rubber or gutta percha, either alternately or combined, upon electric telegraph line wires by passing the wire to be so coated successively through a bath containing the juice or juices of the India-rubber and gutta percha trees, and a shaft containing heated air or gases, to consolidate or vulcanize the covering; also the combination of such successive coats with layers or coats of insulating material applied in any known manner.

Thirdly, effecting a tenacious covering to insulated telegraph line wire by saturating the fibrous material employed in forming the same with the juice or milk of the India-rubber or gutta percha trees, in the manner as hereinbefore described.

Fourthly, the construction and use of posts or supports to electric telegraph line wires composed of a foundation plate of cast or wrought iron, or equivalents for the same, to which is attached by bolts or otherwise a pipe or socket of cast or wrought iron, rising to some height above the ground, and receiving in its upper end a conical or cylindrical welded wrought-iron tube cemented into the same, and carrying the insulating supports for the line wires, substantially as hereinbefore described with reference to the accompanying drawing.

Fifthly, the construction of insulating supports for suspending the line wire or line wires from posts, as hereinbefore described with reference to the accompanying drawing.

In witness whereof, I, the said Charles William Siemens, have

hereunto set my hand and seal, this fifteenth day of August, in the year of our Lord one thousand eight hundred and sixty-three.

C. W. SIEMENS. [L. S.]

Witness,
THOS. TAYLOR,
20, *Southampton Buildings, Chancery Lane.*

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1863.

83 DEFENDANT'S EXHIBIT HENLEY PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Test: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1864, 4th May. No. 1126.

Specification of William Thomas Henley.

Telegraph wires and cables.

London: Printed by George E. Eyre and William Spottiswood printers to the Queen's most excellent majesty: Published at th Great Seal Patent Office, 25, Southampton buildings, Holborn. 186 Price, 3*s.*

84 [British coat of arms.]

A. D. 1864, 4th May. No. 1126.

Telegraph Wires and Cables, &c.

Letters patent to William Thomas Henley, of Saint John Street road, in the county of Middlesex, telegraphic engineer, for the invention of "improvements in telegraph wires and cables, and in apparatus used in their manufacture, parts of which improvements are applicable to other useful purposes."

Sealed the 28th October 1864, and dated the 4th May 1864.

Provisional specification left by the said William Thomas Henley at the office of the commissioners of patents, with his petition, on the 4th May 1864.

I, William Thomas Henley, of Saint John Street road, in the county of Middlesex, telegraphic engineer, do hereby declare the nature of the said invention for "improvements in telegraph wires and cables, and in apparatus used in their manufacture, parts of which improvements are applicable to other useful purposes," to be as follows:—

The first part of my improvements relates to the insulating of the conducting wires, which may be of copper or other suitable metal, but I propose to use for that purpose when the line is not of very great length what is known as homogeneous metal, being a mild kind of steel produced by decarbonizing pig iron; this when drawn into wire, and well annealed, becomes nearly as soft as copper, and at the same time possesses great strength.

85 I insulate this or other suitable wire by the machinery represented in sheets 1, 2, and 3. In sheets 1 and 2, A is a steam chest for keeping the compound, through which the wires pass, fluid. The wire is coiled on the bobbin B, and is taken from thence through the composition under the sheaves *a*, *a*, and then passes up to the first covering disc *b* (this should be placed in an upper floor some distance above the steam chest), the wire here receives a coating of dry cotton or other suitable fibrous material from the bobbins, it then passes over the sheave *c*, descends to the steam chest, and receives another application of the composition, it then passes under another pair of sheaves, and on leaving the steam chest it passes through a conical die which presses the hot compound into the cotton, and at the same time takes off all the superfluous material; the wire then ascends to the second covering disc and receives another covering of yarn in the opposite direction to the former, and again passes over a sheave and descends to the steam chest and gets another covering of the compound, after which it may be taken away over the sheave at the top and through the grooved rollers *e* and *f*, sheet 2, to the taking off drum; or the covering with yarn and composition may be repeated as many times as may be thought necessary according to the amount of insulation required. The table carrying the upper sheaves is driven by the screw and worm wheels same as the taking off drum so that there may not be too much strain on the wire or covering by being pulled over the number of sheaves. Instead of yarn the wire may be covered with tape, the last covering may be of tape. I am aware that attempts have been made before to insulate telegraph wires by alternately covering with cotton or silk and resinous matters, but owing to each covering having been made a separate operation the work was so imperfectly done that the covering was useless as an insulator.

Sheet 3 shows another arrangement of machinery for accomplishing the same purpose as that shown at sheets 1 and 2, A, A, being the steam chests, and B, B, the covering discs, of course these may be multiplied to any extent according to the number of coatings required. I do not confine myself to any of the exact plans herein described so long as the arrangement is carried out of applying all the coatings of composition and fibrous materials at one and the same time, neither do I confine myself to any particular composition for saturating the cotton, but find a very cheap and serviceable material in a mixture of linseed oil and resin in or about equal proportions, resin, gutta percha, and beeswax also answers the purposes very well.

My second improvement relates to the welding or joining steel or

iron wires for telegraphic or other purposes, or for the cover-
86 ing of cables. In the ordinary method of welding wires the union of the metal is very imperfect and the joint is neither round or of the size of the other part of the wire.

I propose to obviate this by employing machinery as represented in sheet 4, where A and B, Figs. 1 and 2, are two grooved pulleys, shown also at Fig. 3; these are made to suit the diameter of the wire to be welded. The lower pulley has merely a semicircular groove, the other is of the same shape at the bottom of the groove, but is deeper with flat sides so as to overlap the lower. Both sheaves can be made with simple semicircular grooves only, but I prefer the former plan. The upper sheave or roller has a part of its periphery cut off so as to leave it somewhat of the shape shown at figure 1, this is so made that when at rest, as shown in the drawing, the wire to be welded can be laid on the anvil C. The two ends of the wire having been brought to a welding heat when the apparatus is thrown into gear, the cam D forces the top tool E on the wire, and partly welds it, and by that time the upper sheave bites it and causes it to be drawn between the rollers and completes the operation, at the same time elongating it somewhat, and giving the wire at the weld a fibrous character. As soon as the weld is drawn through the rollers the apparatus shown at figure 4 throws the apparatus out of gear and the machinery is brought to a state of rest ready for the next weld. The clutch is thrown out of gear by the lug F on the wheel G which pushes back the lever H. The springs I and J acting on the flat portion of the wheels K and L and causing them always to rest in the same position suitable for the work when thrown into gear again. I propose to use gas for heating the wire to be welded, the wire being kept much cleaner and free from scale. The apparatus is shown at figures 5 and 6, sheet 4, A is a dome containing the gas jets, I prefer to make the dome of fire clay or some similar substance, although metal will answer the purpose.

Figures 7, 8, and 9, sheet 4, show an improved blow pipe for heating the wire to be welded or for soldering. It has two tubes connected, one for the supply of air, the other for the supply of gas. The two plugs *a*, *a*, when pressed down by the springs *b* close the passages, except that connected with the gas, which allows a small quantity to pass just sufficient to keep it alight. When used by hand, pressure with the thumb or finger on the button *c* opens both plugs and allows air and gas to flow. When used with the forge, as at Fig. 5, the movement of the lever *d* opens and shuts both cocks at the same operation. The air should be connected with the inner tube at the nozzle.

Fig. 1, sheet 5, shows a small machine for welding small wire. The two ends of the wire are scarfed and held together by a pair
87 of clamps *a*, *a*, so that the ends are in a suitable position for the flame of a blow pipe *b* to play on them when brought to a proper heat. A sharp pressure with the hand on the lever *c* bring the jaws *d*, *d*, together, and perfectly welds the wire, and the same motion shuts off the gas and air.

The third part of my improvements relates to apparatus used in

covering cables on the outside with bitumen or other substances to prevent decay of the iron protecting wires. Hitherto when the cables have been covered with yarn and the bituminous compound the covering has been left in a very irregular and rough state.

To obviate this I use the hollow tongs and grooved rollers as shown at figures 2, 3, and 4, sheet 5. The cable after having the hot compound poured on it by elevators is clasped by the tongs A which are made of such a size as to allow a suitable quantity of compound to remain on the yarn, whilst the bell shape of the mouth of the tongs, as the cable passes through, causes the compound to be forced into the yarn, whilst the tongs can be readily opened and freed from the cable should any clogging or obstruction take place. After leaving the tongs the cable passes between the grooved rollers B, C, and is further compressed, and the two sides of the upper roller act with the lower like a double pair of shears, all the superfluous compound which would otherwise form a "fin" or rib on each side being thus removed. A stream of water plays on the cable and rollers and prevents the compound sticking, I am aware that simple grooved rollers have been described or used before for this purpose, but what I claim as new in so far as the rollers are concerned is the employment of one roller with deep sides to the groove, so as to embrace the other, and form shears to pare off the superfluous compound, as well as to compress the covering and give it its proper shape. As it is desirable to be able to gauge the wire during and after the manufacture, for this purpose I have invented an improved gauge as shown at sheet 6, by this gauge the size can be ascertained very correctly. The jaw A is moved by the screw B, or by pressure with the thumb, until it touches the wire to be gauged, and by the rack and pinion gives motion to the index and shows the number of gauges and the size in decimals at the same time.

Specification in pursuance of the conditions of the letters patent, dated by the said William Thomas Henley in the Great Seal Patent Office on the 4th November 1864.

To all to whom these presents shall come, I, William Thomas Henley, of Saint John Street road, in the county of Middlesex, telegraphic engineer, send greeting.

88 Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the fourth day of May, in the year of our Lord one thousand eight hundred and sixty-four, in the twenty-seventh year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said William Thomas Henley, her special licence that I, the said William Thomas Henley, my executors, administrators, and assigns, or such others as I, the said William Thomas Henley, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and

Isle of Man, an invention for "improvements in telegraph wires and cables, and in apparatus used in their manufacture, parts of which improvements are applicable to other useful purposes," upon the condition (amongst others) that I, the said William Thomas Henley, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said William Thomas Henley, do hereby declare the nature of my said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement reference being had to the drawings hereunto annexed, that is to say :—

(Here follow diagrams marked pp. 93, 94, 95, 96, 96*a*, 96*b*, 97, & 98.)

The first part of my invention relates to the insulating of the conducting wires, which may be of copper or other suitable metal, but I prefer to use for that purpose, when the line is not of very great length, what is known as homogen-ous metal, being a mild kind of steel produced by decarbonizing pig iron ; this when drawn into wire and well annealed becomes nearly as soft as copper, and at the same time possesses great strength. I insulate this or other suitable wire by the machinery represented on sheet 1.

In figures 1 and 2, A is a steam chest for keeping the compound through which the wires pass, fluid. The wire is coiled on the bobbin B, and is taken from thence through the composition under the sheaves *a*, *a*, and then passes up to the first covering disc *b*. (This should be placed in an upper floor, some distance above the steam chest). The wire here receives a coating of dry cotton or other suitable fibrous material from the bobbins, it then passes over the sheave *c*, descends to the steam chest, and receives another application of the composition, it then passes under another pair of sheaves and on leaving the steam chest it passes through a conical die which presses the hot compound into the cotton, and at the same time takes off all the superfluous material, the wire then ascends to the second covering disc, and receives another covering of yarn in the opposite direction to the former, and again passes over a sheave and descends to the steam chest, and gets another covering of the compound, after which it may be taken away over the sheave at the top and through the grooved rollers *e* and *f*, figure 2, to the taking off drum ; or the covering with yarn and composition may be repeated as many times as may be thought necessary according to the amount of insulation required. The axle carrying the upper sheaves is driven by the screw and worm wheels in the same manner as the taking off drum, so that there may not be too much strain on the wire or covering by being pulled over the number of sheaves. Instead of yarn the wire may be covered with tape or the last covering may be of tape, I am aware that attempts have been made be-

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fore to insulate telegraph wires by alternately covering with cotton or silk and resinous matters, but owing to each covering having been made a separate operation the work was so imperfectly done that the covering was useless as an insulator.

Figure 3 shows another arrangement of machinery for accomplishing the same purpose as that shewn at figures 1 and 2. A, A, being the steam chests, and B, B, the covering discs, of course these may be multiplied to any extent according to the number of coatings required, I do not confine myself to any of the exact plans herein described so long as the arrangement is carried out of applying all the coatings of composition and fibrous materials at one and the same time, neither do I confine myself to any particular composition for saturating the cotton, but find a very cheap and servic-able material in a mixture of linseed oil and resin in or about equal proportions, resin, gutta percha, and beeswax also answer the purpose very well.

My second improvement relates to the welding or joining steel or iron wires for telegraphic or other purposes or for the covering of cables. In the ordinary method of welding wires the union of the metal is very imperfect, and the joint is neither round or of the size of the other part of the wire. I propose to obviate this by employing machinery as represented in sheet 2, where A and B, figures 1 and 2, are two grooved pulleys shewn also at figure 3; these are made to suit the diameter of the wire to be welded. The lower pulley has merely a semicircular groove, the other is of the same shape at the bottom of the groove, but it is deeper, with flat sides so as to overlap the lower. Both sheaves can be made with simple semi-
90 circular grooves only, but I prefer the former plan. The upper sheave or roller has a part of its periphery cut off so as to leave it somewhat of the shape shewn at figure 1, this is so made that when at rest, as shewn in the drawing, the wire to be welded can be laid on the anvil C. The two ends of the wire having been brought to a welding heat, when the apparatus is thrown into gear the cam D forces the top tool E on the wire and partly welds it, and by that time the upper sheave bites it and causes it to be drawn between the rollers and completes the operation, at the same time elongating it somewhat and giving the wire at the weld a fibrous character. As soon as the weld is drawn through the rollers the apparatus shewn at figure 4 throws the apparatus out of gear and the machinery is brought to a state of rest ready for the next weld. The clutch is thrown out of gear by the lug F on the wheel G, which pushes back the lever H; the springs I and J acting on the flat portion of the wheels K and L, and causing them always to rest in the same position suitable for the work; when thrown into gear again, I prefer to use gas for heating the wire to welded, the wire being kept much cleaner and free from scale. The apparatus is shewn at figures 5 and 6, A is a dome containing the gas jets; I prefer to make the dome of fire-clay or some similar substance, although metal will answer the purpose.

Figures 7, 8, and 9 shew an improved blow pipe for heating the wire to be welded or for soldering. It has two tubes connected,

one for the supply of air, the other for the supply of gas. the two plugs *a*, *a*, when pressed down by the springs *b* close the passages, except that connected with the gas, which allows a small quantity to pass just sufficient to keep it alight. When used by hand pressure, with the thumb or finger on the button *c* opens both plugs, and allows air and gas to flow. When used with the forge, as at figure 5, the movement of the lever *d* opens and shuts both cocks at the same operation. The air should be connected with the inner tube at the nozzle.

Figure 10 shews a small machine for welding small wire. The two ends of the wire are scarfed and held together by a pair of clamps *a*, *a*, so that the ends are in a suitable position for the flame of a blow pipe *b* to play on them; when brought to a proper heat, a sharp pressure with the hand on the lever *c* brings the jaws *d*, *d*, together, and perfectly welds the wire, and the same motion shuts off the gas and air.

The third part of my improvements relates to apparatus used in covering cables on the outside with bitumen or other substances to prevent decay of the iron protecting wires. Hitherto when the cables have been covered with yarn and the bituminous compound, the covering has been left in a very irregular and rough state. To obviate this I use the hollow tongs and grooved
91 rollers, as shewn at figures 11, 12, and 13. The cable after having the hot compound poured on it by elevators is clasped by the tongs A which are made of such a size as to allow a suitable quantity of compound to remain on the yarn, whilst the bell shape of the mouth of the tongs, as the cable passes through, causes the compound to be forced into the yarn, whilst the tongs can be readily opened and freed from the cable should any clogging or obstruction take place. After leaving the tongs the cable passes between the grooved rollers, B, C, and is further compressed, and the two sides of the upper roller act with the lower like a double pair of shears, all the superfluous compound which would otherwise form a "fin" or rib on each side being thus removed. A stream of water plays on the cable and rollers, and prevents the compound sticking. I am aware that simple grooved rollers have been described or used before for this purpose, but what I claim as new, in so far as the rollers are concerned is the employment of one roller with deep sides to the groove, so as to embrace the other, and form shears to pare off the superfluous compound as well as to compress the covering and give it its proper shape. As it is desirable to be able to gauge the wire during and after the manufacture, for this purpose I have invented an improved *guage* as shewn at figure 14; by this gauge the size can be ascertained very correctly. The jaw A is moved by the screw B, or by pressure with the thumb, until it touches the wire to be gauged, and by the rack and pinion gives motion to the index and shews the number of *guage* and the size in decimals at the same time.

And having now described the nature of my said invention, and in what manner the same is to be performed, I declare that I claim as my "improvements in telegraph wires and cables, and

in apparatus used in their manufacture, parts of which improvements are applicable to other purposes,"—

First, forming the conducting wires where they have to be covered with insulating material of homogen-ous metal as hereinbefore described.

Second, the insulating of the conducting wires with one or several coatings of compositions and fibrous materials at one and the same time as hereinbefore described and illustrated at figures 1, 2, and 3, sheet 1, of the accompanying drawings.

Third, the welding or joining of steel or iron wires in manner hereinbefore described and illustrated at figures 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, sheet 2, of the accompanying drawings.

Fourth, the employment of apparatus consisting of hollow tongs and grooved rollers, one roller being formed with deep sides to the groove so as to embrace the other, and form shears to pare off superfluous material from the surface of cables, as well as to
92 compress the covering and give it its proper shape, all as hereinbefore described and illustrated at figures 11, 12, and 13 of the accompanying drawings.

Fifth, the construction of apparatus for gauging wire as hereinbefore described and illustrated at figure 14 of the accompanying drawings.

In witness whereof, I, the said William Thomas Henley, have hereunto set my hand and seal, this third day of November, one thousand eight hundred and sixty-four.

W. T. HENLEY. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1864.

99 DEFENDANT'S EXHIBIT JALOUREAU AND LARDY PATENT. F. C. E., N. P. March 17, 1886.

THE ANSONIA BRASS & COPPER CO.
vs.
TH- ELECTRICAL SUPPLY CO.

[British coat of arms.]

In evidence in circuit court. Attest: E. E. Marvin, clerk.

A. D. 1867, 19th October. No. 2942.

Specification of Alfred Fauvin Jaloureau and Charles Louis Lardy.

Telegraphic cables, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. Published at the Great Seal Patent Office, 25 Southampton buildings, Holborn. 1868. Price, 1*s*.

100 [British coat of arms.]

A. D. 1867, 19th October. No. 2942.

Telegraphic Cables, &c.

Letters patent to Alfred Fauvin Jaloureau, civil engineer, of Paris, in the Empire of France, and Charles Louis Lardy, doctor of law and professor at the academy, Neuchatel (Switzerland), for the invention of "improvements in the construction of telegraphic cables and in the apparatus for the manufacture thereof."

Sealed the 31st March, 1868, and dated the 19th October, 1867.

Provisional specification left by the said Alfred Fauvin Jaloureau and Charles Louis Lardy, at the office of the commissioners of patents, with their petition, on the 19th October, 1867.

We, Alfred Fauvin Jaloureau, civil engineer, of Paris, in the Empire of France; and Charles Louis Lardy, doctor of law and professor at the academy, Neuchatel (Switzerland), do hereby declare the nature of the said invention for "improvements in the construction of telegraphic cables, and in the apparatus for the manufacture thereof," to be as follows:—

Our improved cables for submarine and other purposes are constructed in the following manner:—The copper conducting wire is first covered with bituminously prepared thread or twine; the cable thus formed is then subjected to a hot bituminous bath, by which a layer or deposit of bitumen is obtained; this is covered with bituminously prepared paper wound spirally round the cable; it is then again subjected to the bath and a second layer of bitumen deposited thereon, after which it is again covered with the paper as before, and then covered with bitumen by means of the
101 bath, then another layer of paper, then a layer of bitumen, then a layer of paper, then a coating of thread as before, and finally a layer or coat of bitumen, which latter is sanded all over. And in cases where a stronger cable is required it may be protected by iron bands wound in a spiral form round it; this is done previously to the final coating and sanding. The cables thus manufactured are flexible and solid, whilst at the same time the wires being perfectly independent have all the necessary conducting properties, and from the simplicity of the manufacture and the materials employed therein these cables have considerable advantages over those in present use.

The foregoing description will be readily understood by the accompanying account of the apparatus and its employment in the manufacture of our cables.

The machine consists of a suitable iron or wooden frame, at one end of which is a drum, round which the copper wire conductor is wound, from thence it passes between two pullies which press it closely, the object being to regulate the paying out or delivery of the wire; they receive motion from the driving shaft by means of an endless screw mounted thereon, and which governs a toothed wheel keyed

to the axis of the lower pulley, the upper one being so disposed as to press the wire, which passes from thence through an opening made in the axis of the toothed wheel, then through a guide support near which it is enveloped by two threads previously bituminously prepared which unwind from two bobbins turning round the wire, which movement they receive from the toothed wheel on which they are mounted. On leaving the bobbins the threads pass through two small cylindrical guides fixed on the guide support before alluded to, which follows the movement of the wheel with which it is connected; these two guides are inclined and so arranged as to regulate the winding of the threads round the wire, which in passing above a boiler containing bitumen (melted either by means of steam conducted thereto by pipes or by any other means for heating) comes in contact with the generator of a cylinder, which in revolving bathes the cable in the heated bitumen, thus forming a coat, the thickness of which is regulated by a metal cone through which the cable passes, and which is fixed on the side of the boiler, from thence the cable passes through a second wheel by means of an opening made in the axis; here it receives a double casing of paper bituminously prepared and delivered, as before, from bobbins rotating outside the cable. This movement is produced by the wheel on which the bobbins are mounted. The strips of bituminous paper pass through openings made in a guide fixed on the wheel above mentioned, and which turn with it; these openings are so arranged as to cause the paper to wind in a slanting manner round the cable, which then passes through a second
102 hot bath of bitumen and is then again covered with paper. This operation is repeated three or four times so as to obtain as many coats of bitumen separated and maintained by coatings of bituminous paper. When the cable has received its last double envelope of paper it passes in a support furnished with gear wheels and four bobbins exactly similar to those already described; it here receives a casing of bituminous thread formed by the four threads from the aforesaid bobbins, the object being to protect the cable from external danger; it is then finally covered with a coat of bitumen, and passing through a box at the end of the apparatus is sanded all over. When the cable is thus completed it passes between three pullies at the end of the apparatus, the object of which are, first, to regulate the delivery, the second to cause the sand to penetrate the outer coat of bitumen, and the third to gauge and give the cable an even and circular form.

Specification in pursuance of the conditions of the letters patent, filed by the said Alfred Fauvin Jaloureau and Charles Louis Lardy in the Great Seal Patent Office on the 17th April, 1868.

To all to whom these presents shall come, we, Alfred Fauvin Jaloureau, civil engineer, of Paris, in the Empire of France, and Charles Louis Lardy, doctor of law and professor at the academy, Neuchatel, Switzerland, send greeting.

Whereas her most excellent majesty Queen Victoria, by her

letters patent, bearing date the nineteenth day of October, in the year of our Lord one thousand eight hundred and sixty-seven, in the thirtieth year of her reign, did for herself, her heirs and successors, give and grant unto us, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, her special licence that we, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, our executors, administrators, and assigns, or such others as we, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the construction of telegraphic cables, and in the apparatus for the manufacture thereof," upon the condition (amongst others) that we, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, our executors or administrators, by an instrument in writing under our, or
103 their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that we, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, do hereby declare the nature of our said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement and accompanying drawings, that is to say:—

Our improved cables are constructed in the following manner:—The copper conducting wire is first covered with bituminously prepared thread or twine; the cable thus formed is then subjected to a hot bituminous bath, by which a layer or deposit of bitumen is obtained; this is covered with bituminously prepared paper wound spirally round the cable; it is then again subjected to the bath, and a second layer of bitumen deposited thereon, after which it is again covered with the paper as before, and then coated with bitumen by means of the bath, then another layer of paper, then a layer of bitumen, then a layer of paper, then a layer of thread as before, and finally a casing of bitumen, which is sanded all over, and in cases where desired to make a more powerful cable it may be strengthened by iron bands wound in a spiral form round it; this is done previously to the final coating and sanding. The cables thus manufactured are flexible and solid, whilst at the same time the wires being perfectly insulated have all the necessary conducting properties, and from the simplicity of the manufacture and the materials employed therein have considerable advantages over those in present use.

Having thus described the cable we will now proceed to explain the apparatus for manufacturing the same by aid of the accompanying drawings.

(Here follow diagrams marked pp. 106 & 107.)

It consists of a wood or iron frame, at one end of which is a drum A, round which the copper wire conductor is wound; from thence it passes between two pullies B, B^1, which press it closely, the object being to regulate the paying out or delivery of the wire; they receive motion from the driving shaft P by means of an endless screw M mounted thereon, and which governs a toothed wheel *b* keyed to the axis of the lower pulley B, the upper one B^1 being disposed so as to press the wire, which passes from thence through an opening made in the axis of the toothed wheel *b*, then through a guide support *s*, near which it is enveloped by two threads previously bituminously prepared, which unwind from two bobbins C, C, turning round the wire, which movement they receive from the toothed wheel *b*,
104 on which they are mounted. On leaving the bobbins the threads pass through two small cylindrical guides *r*, *r*, fixed on the guide support *s* alluded to before, which follows the movement of the wheel *b* with which it is connected; these two guides are inclined and so arranged as to regulate the winding of the threads round the wire, which in passing above a receiver E containing bitumen (melted either by steam conducted thereto by the pipe L, or by any other means for heating) comes in contact with the generator of a cylinder I, which in revolving bathes the cable in the heated bitumen, thus forming a coat the thickness of which is regulated by a metal cone *p*, through which the cable passes, and which is fixed on the side of the receiver E; from thence the cable passes through a second wheel b^1 by means of an opening made in the axis; here it receives a double casing of paper bituminously prepared and delivered as before from bobbins D, D, rotating outside the cable. This movement is produced by the wheel b^1, on which the bobbins D, D, are mounted. The slips of bituminized paper pass through openings *f*, *f*, made in a guide T fixed on the wheel b^1 above mentioned and which turn with it; these openings are so arranged as to cause the paper to wind in a slanting manner round the cable, which then passes through a second hot bath E^1 of bitumen, and it then again receives a double coating of bituminized paper from the bobbins D^1, D^1. This operation is repeated three or four times, or even more if necessary, by aid of the bituminous baths E^2, E^3, and of the bobbins D^2, D^2, so as to obtain as many coats of bitumen separated and maintained by as many double coatings of bituminized paper. When the cable has received its last double envelope of paper it passes in a support R^3 furnished with a gear wheel b^4 and four bobbins C^1, C^1, C^1, C^1, exactly similar to those already described; it here receives a casing of bituminized thread formed by the four threads from the aforesaid bobbins C^1, the object being to protect the cable from external danger; it is then finally covered with a coat of bitumen, and passing through the case or box E^2, similar to the preceding receivers at the end of the apparatus, is sanded all over. When the cable is thus completed it passes between four pullies N, G, O, X, the object of which are, first, to regulate the delivery; the second, to cause the sand to penetrate the outer coat of bitumen; and the third, to gauge and give the cable an even and circular form. The groove pulley G is

actuated by a toothed wheel mounted on its axis and governed by an endless screw M keyed to the driving shaft P, the pullies O and X are animated by a rotary motion sufficiently rapid to admit of their giving a certain degree of smoothness to the cable, which from thence is rolled round the drum A. All the thread and paper-bearing bobbins, as well as the cylinders containing the bitumen, receive motion from the shaft P by aid of the pinions c, c^1, c^2, c^3, c^4, of the intermediate wheels d, d^1, d^2, d^3, d^4, governing the wheels b, b^1, b^2, b^3, b^4, giving motion to the bitumen distributing cylinders by aid of bands and flat or grooved pullies and cords. In cases where bands of metal are wound round the cable (which is done previously to its receiving the final bituminous coating), such bands are twisted in a manner inversely to the bituminous thread casing.

These machines may also be constructed so as to revolve the conducting wire, and by rendering stationary the bobbins bearing the thread and paper; this is effected by placing the drum A and the pullies N, G, O, X, on large platforms receiving rotary motion from a single shaft; the delivery of the wire will be produced by means of pullies, the movement of which is regulated by means of a fixed spiral screw placed on the support of the drum; the advantages of this arrangement would facilitate supervision during the working of the machine and the ready supply of fresh bobbins when required without stopping the machine.

These machines may be so constructed and of such form and dimensions as will admit of the driving shaft being placed either above or below the bobbins and of its being actuated by bands and pullies instead of toothed wheels.

Lastly, we must here remark that the bitumen we make use of in forming the coats or casings is pure, but used at different degrees of temperature, which render it more or less liquid. The interior coats should be made of distilled bitumen from 20 to 25 degrees, so as to render it more supple, and the external coats made from the same substance at a temperature of from 25 to 30 degrees, so that it may be dryer. Any kind of bitumen, whether mineral or vegetable, on condition that it is sufficiently pure to be insulating.

As already mentioned we can manufacture our cables in making use of conducting wires of copper or iron, galvanized or otherwise, or by the employment of other metal wires, and in place of the twisted threads we can make use of untwisted threads of any vegetable or animal fibre, we can also substitute for the bituminous bands of paper bands of ribbon, thread, cotton, or other textile matter. In cases where the cables are liable to injury from carelessness or external injuries when laid inland through villages we protect them by putting them in wooden cases injected with creosote and bitumen, a section of which arrangement is shewn at Fig. 7; the cables may also be placed in metal or earthenware tubes or bituminously prepared paper tubes or cases.

Finally, what we claim and desire to secure by letters patent is the insulating of the conducting wire or wires for submarine and other cables by the use of bitumen applied in thin coat-

ings or layers separated and maintained successively by double casings of bituminized paper, and protected by bituminized thread, which latter may be secured against external injury when deemed advisable by iron or wire bands, the whole being constructed precisely in the manner and for the purposes as herein described and illustrated by the accompanying drawings, of which Fig. 1, sheet 1, is an elevation of the machine, and Fig. 2, a plan of the same; Fig. 1 of the sheet 2 is a section following the line 1, 2, of Fig. 1, sheet 1; Fig. 2 is a section following the line 3, 4, of Fig. 1, sheet 1; Fig. 3 is a section following the line 5, 6, of Fig. 1, sheet 1; Fig. 4 is a longitudinal section of the cable, shewing gradually the disposition of the protecting and insulating envelopes or casings; Fig. 5 shews in transverse sections the different degrees of formation of the cable, which are indicated by the longitudinal section, Fig. 4; Fig. 6 shews an external view of the cable as provided with metal bands previous to receiving the final coating of bitumen; and Fig. 7 is a transverse section of the wooden cases for protecting the cable when laid in land or through towns or villages.

In witness whereof, we, the said Alfred Fauvin Jaloureau and Charles Louis Lardy, have hereunto set our hands and seals, this thirteenth day of April, in the year of our Lord one thousand eight hundred aad sixty-eight.

ALFRED FAUVIN JALOUREAU. [L. S.]
CHARLES LOUIS LARDY. [L. S.]

London: Printed by George Edward Evre and William Spottiswoode, printers to the Queen's most excellent majesty. 1868.

109 DEFENDANT'S EXHIBIT ROGERS PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1870, 19th December. No. 3314.

Specification of Joseph Rogers.

Insulating telegraph wires.

London: Printed by George E. Evre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1871. Price 4*d*.

110 [British coat of arms.]

A. D. 1870, 19th December. No. 3314.

Insulating Telegraph Wires.

(This invention received provisional protection only.)

Provisional specification left by Joseph Rogers at the office of the commissioners of patents, with his petition, on the 19th December 1870.

I, Joseph Rogers, of Islington, in the county of Middlesex, do hereby declare the nature of the said invention for "improvements in insulating telegraph wires, and in the machinery or apparatus to be employed therein," to be as follows:—

This invention relates to certain improvements in insulating telegraph wires for submarine, subterranean, or overland purposes, and in the machinery or apparatus whereby such improvements are effected.

In order to insulate a single wire conductor, or a strand of wires, I coil such wire or strand around a drum or reel set in standards, and controlled by a friction break-, and I arrange in suitable bearings a series of bobbins containing yarns or threads of fibrous material, in such manner as to surround the wire or strand as it is drawn from the reel or drum, each bobbin being checked by a friction break-. The wire or strand is then drawn together with the fibrous materials through a trough constructed in sections or divisions, the first of which contains heated air, the second forming a cauldron of insulating material or compound, and the others being constructed to repeat the process as may be required. Now, the passage of the wire and fibres through the hot air chamber serves effectually to remove all moisture from the surface of the wire and to heat the metal; it also desiccates the fibre, thus rendering both more capable of taking up the insulating compound, and entirely avoiding the generation of air cells between the conductor and the insulator. In the division between the air chamber and cauldron, which division consists of a sliding plate set in channels or grooves, I form a central aperture for the passage of the wire, and a series of concentric apertures for the fibres to pass into the cauldron, within which I set one or more perforated discs which revolve within a frame, and through which the fibres pass. Consequently the wires and fibres first become separately charged or coated with insulating material, and then the fibres so coated are twisted or coiled around the wire, after which the whole is passed through a trumpet mouthed tube in order to compress the mass, still allowing free and sufficient space between the wire and fibre to ensure the wire being completely insulated.

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To further insulate the conductor I employ a second series of bobbins and fibres, and draw the insulated wire from the cauldron within their range and through a disc and second trumpet tube of increased dimensions, all being subjected to the influence of insulating material in the trough, and this process may be repeated

as often as desired, according to the purpose of the conductor whether for deep sea or land purposes. The trough may therefore be of any length required, and subdivided accordingly into chambers by means of adjustable slides. The trough is encased by a jacket, into and through which steam is admitted in order to heat the air chamber, and to maintain the solvent condition of the insulating materials, which may consist of gutta percha, India-rubber, or any of their compounds, or of any other insulating medium, to which I lay no claim, but I prefer to use the compound patented by me under date April 25rd, 1868, No. 1336. The conductor is ultimately drawn out through a die, and dusted over with chalk, silicate, or other earthy dust, for the purpose of avoiding stickiness or tack, and it may be passed through a water chamber for the same object, and finally wound on a drum for use.

I also propose to lay together a number of such insulated conductors in the form of a rope, and to pass them through a cauldron of the heated compound, previous to the application of a
112 special binding of yarns or strips of fibrous materials, and to again saturate the entire mass by finally passing it through a cauldron, and to dust it over as described.

It will thus be observed that the process is continuous, whatever may be the ultimate dimension of the cable. For land purposes, a single insulation may be sufficient and the conductor may be at once withdrawn, but for deep sea cables the process may be repeated by successive operations in one and the same trough.

The apparatus is very simple in construction, the trough should be made of galvanized iron supported on standards, and secured by rivets, bolts, or screws, and nuts.

In order to insulate a number or series of wires by one process, I propose to lay them between two cloths or fabrics by the following means:—I mount between two discs a cloth of the desired width, one above the other, with friction break-s attached. I then coil as many conducting wires as may be necessary on separate reels or on one large drum, with friction pullies attached; the wire and fabrics are then passed through a frame containing upper and lower slots for the passage of the cloth, and also containing apertures for the wires, so that the two are passed through the heated chamber, and thence by corresponding inlets to the cauldron, where the cloth and wires become coated; in the centre of the cauldron I fix a frame for the purpose of expanding the cloth from the wires, and at the end of the cauldron I place a die of the exact width and breadth that may be required for the final passage of the cloth and wires (after insulation), whence they are drawn off by rollers and dusted over as described. In this process also the cloth may receive extra layers on the same principle adopted in insulating single strands and fibres, and several series of wires so insulated by bands or strips may be placed together to form a number of independent conductors.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1871.

113 DEFENDANT'S EXHIBIT JAMES PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1880, 31st March. No. 1333.

Specification of George Frederick James.

Machinery for the manufacture of engine packing, insulated telegraph wires, &c.

Printed by order of the commissioners of patents for inventions.

London: Published and sold at the commissioners of patents' sale department, 38 Cursitor street, Chancery Lane, E. C. 1880.
Price, 6*d*.

114 A. D. 1880, 31st March. No. 1333.

Machinery for the Manufacture of Engine Packing, Insulated Telegraph Wires, &c.

Letters patent to George Frederick James, of Salford, in the county of Lancaster, for an invention of "improvements in or applicable to machinery or apparatus for the manufacture of engine packing, insulated telegraph wires, and other similar manufactures."

Provisional specification left by the said George Frederick James at the office of the commissioners of patents on the 31st March 1880.

GEORGE FREDERICK JAMES, of Salford, in the county of Lancaster.

"Improvements in or applicable to machinery or apparatus for the manufacture of engine packing, insulated telegraph wires, and other similar manufactures."

This invention has for its object both the lapping and braiding or plaiting of any desired number of threads or strands or series of laps or braidings round any desired central core in one and the same machine, and consists in so arranging the lapping spindles and the braiding spindles in the same framework, and by preference to revolve round the same axis, that the core, say, after being lapped, is then taken through one or more series of braiding spindles, which braid a corresponding number of coatings of braid upon such lapped material.

This arrangement of mechanism being useful in the manufacture of engine packing, in insulating telegraph wires, and for other analogous purposes. This invention further relates to improvements

in the hopper or funnel hitherto employed in the manufacture of engine packing, in which china clay or other lubricating powder or liquid is introduced in the course of manufacture, and forms either a core or coating of the same; also in the manufacture of insulated telegraph wires and fuses, and other similar manufactures, and consists in applying an outer casing to such hopper or funnel, through which steam, hot water, or other heating medium may be circulated, and so keep the contents of the hopper or funnel in a heated and, if required, also liquid state. And in order to agitate such contents mechanically instead of by hand, as heretofore, I employ a series of knives or stirrers mounted upon a toothed or worm wheel to which revolving motion is imparted, such knives or stirrers dipping into the hopper or funnel, and by revolving therein so keeping up the regular agitation of the contents. I also employ an improved arrangement of apparatus for drawing off the finished work from the above-mentioned machinery, and which consists of a reel or cylinder, to which revolving motion is imparted by a strap or its equivalent from any part of the said machinery, and upon which reel or cylinder the work is so wound.

(Price 6*d*.)

115 Specification in pursuance of the conditions of the letters patent, and of an order of the lord chancellor, filed by the said George Frederick James in the Great Seal Patent Office on the 8th October 1880.

George Frederick James, of Salford, in the county of Lancaster.

"Improvements in or applicable to machinery or apparatus for the manufacture of engine packing, insulated telegraph wires, and other similar manufactures."

This invention has for its object both the lapping and braiding or plaiting of any desired number of threads or strands or series of laps or braidings round any desired central core in one and the same machine, and consists in so arranging the lapping spindles and the braiding spindles in the same framework, and by preference to revolve round the same axis, that the core, say, after being lapped, is then taken through one or more series of braiding spindles, which braid a corresponding number or coatings of braid upon such lapped material, this arrangement of mechanism being useful in the manufacture of engine packing, in insulating telegraph wires, and for other analogous purposes. This invention further relates to improvements in the hopper or funnel hitherto employed in the manufacture of engine packing, in which china clay or other lubricating powder or liquid is introduced in the course of manufacture, and forms either a core or coating of the same; also in the manufacture of insulated telegraph wires and fuses, and other similar manufactures, and consists in applying an outer casing to such hopper or funnel, through which steam, hot water, or other heating medium may be circulated, and so keep the contents of the hopper or funnel in a heated and, if required, liquid state. And in order

to agitate such contents mechanically instead of by hand, as heretofore, I employ a series of knives or stirrers mounted upon a toothed or worm wheel to which revolving motion is imparted, such knives or stirrers dipping into the hopper or funnel, and by revolving therein so keeping up the regular agitation of the contents. I also employ an improved arrangement of apparatus for drawing off the finished work from the above-mentioned machinery, and which consists of a reel or cylinder, to which revolving motion is imparted by a strap or its equivalent from any part of the said machinery, and upon which reel or cylinder the work is so wound. On the accompanying drawing—

(Here follows diagram marked p. 116.)

Fig. 1 represents a front view (partially in section) of a sufficient portion of a combined lapping and braiding machine to illustrate one part of my invention, and Fig. 2 represents on a smaller scale a side view of a similar machine having the other part of my improvements applied thereto. In Fig. 1, A is a lapping spindle consisting of a bobbin B and flyer C, both arranged to revolve round the central hollow spindle D by a band passing round the wharve E. Through this hollow spindle the central core F surrounded by a series of yarns G pass, and in doing so are lapped together by the material carried upon the bobbin, which is drawn off by the action of the flyer in the ordinary manner. This lapped material then passes down through the hollow spindle R, which is by preference concentric with the first mentioned hollow spindle D, and in doing so is subjected in the same machine to the braiding action of one or more braiding spindles S, which braid a corresponding number of coatings of braiding material upon such lapped material, and, if required, additional yarns or threads of fibrous or other material T may be introduced between the lapping and braiding operation, such yarns or threads passing through the guide piece U, and being so guided into position. It will be readily apparent that two or more lapping spindles may be employed, by preference one over the other, and either revolving in the same or alternate direction, in which case a corresponding number of different lappings could be applied to the same central core, and also that two or more series of braiding spindles may be similarly applied. H represents my improved hopper or funnel provided, as illustrated, with an
117 outer casing I, through which steam, hot water, or other heating medium may be circulated, and thus keep the contents of the hopper or funnel in a heated and, if required, also liquid state. J, J, are the knives or stirrers mounted upon a toothed or worm wheel K, to which revolving motion is imparted by the worm L, and thus I stir and keep up the regular agitation of the contents of the funnel or hopper H. The finished work V, see Fig. 2, is in accordance with this invention received upon the creel or cylinder M, to which revolving motion is imparted by a strap M^1 or its equivalent for any suitable part of the machine, such finished work meanwhile having passed in the direction of the arrows round the

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A.D. 1880. March 31. N° 1333.
JAMES' Specification.

(1 Sheet.)

FIG. 1

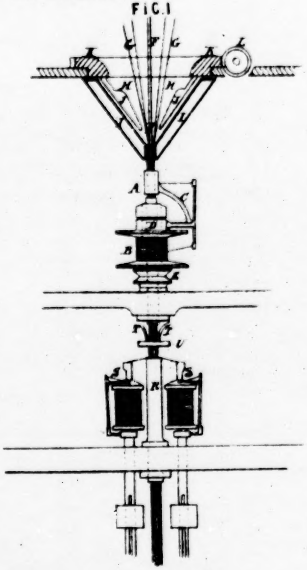
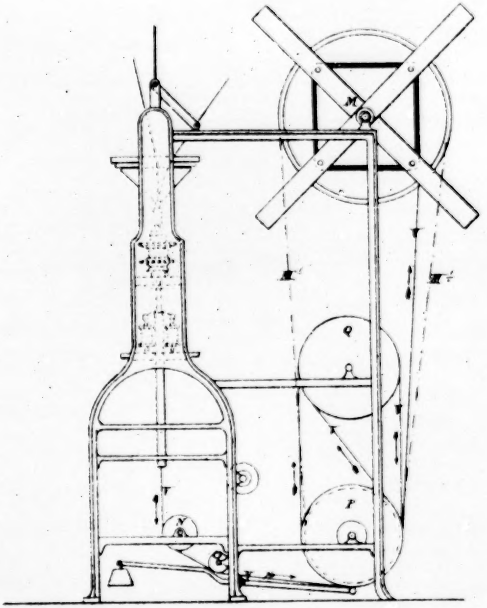


FIG. 2.



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v
Electrical Supply Co.
} p 116

pulleys N and O, and over the cylinders P and Q. Although I have only described a single series of lapping and braiding spindles in one machine, it will be readily understood that several of such combined series could be mounted in the same frame in accordance with my invention.

Having thus particularly described the nature of this my said invention, together with the best methods with which I am acquainted for carrying the same into practical effect, I wish it to be distinctly understood that I do not confine myself to the precise details, relative proportions, or dimensions hereinbefore described and illustrated on the accompanying drawings, as the same may be considerably varied without departing from the invention, but what I claim is,—

1st. Combining lapping and braiding spindles in one and the same machine, substantially as and for the purposes hereinbefore described and illustrated on the accompanying drawings.

2nd. The improved arrangement and construction of the hopper or funnel and mechanism for stirring and agitating the contents of the same, substantially as and for the purpose hereinbefore described and illustrated on the accompanying drawings. 3rd. The improved drawing off mechanism, substantially as and for the purpose hereinbefore described and illustrated on the accompanying drawings.

In witness whereof, I, the said George Frederick James, have hereunto set my hand and seal, this 6th day of October, in the year of our Lord 1880.

G. F. JAMES. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. For her majesty's stationery office. 1880.

118 DEFENDANT'S EXHIBIT WEST PATENT. F. C. E., N. P. March 17, 1886.

THE ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1858, 18th October. No. 2321.

Specification of Charles West.

Insulating and covering wire.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1859. Price 4*d*.

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119 [British coat of arms.]

A. D. 1858, 18th October. No. 2321.

Insulating and Covering Wire.

Letters patent to Charles West, 15 Mornington Place, Camberwell New Road, London, for the invention of "improvements in the mode of insulating and covering wire."

Sealed the 11th February, 1859 and dated the 18th October 1858.

Provisional specification left by the said Charles West at the office of the commissioners of patents, with his petition, on the 18th October 1858.

I, Charles West, 15 Mornington Place, Camberwell New Road, London, do hereby declare the nature of the said invention for "improvements in the mode of insulating and covering wire," to be as follows:—

For many years I have used India-rubber as a means of insulation. The submarine cable which I laid experimentally across Portsmouth harbour upwards of twelve years ago was formed of this material. Subsequently gutta percha has been introduced, but I use the India-rubber in preference. It is less impure than gutta percha, and does not become softened at the same low temperature, and is altogether less affected by heat. From this reason, however, it cannot be drawn on the wire like gutta percha, but must
120 be wound spirally round it by machinery, consequently the tubing of India-rubber so formed is not solid, and in many instances has allowed the water to permeate between the interstices formed by the several layers of India-rubber, thus injuring or destroying the insulation. To remedy this and to make a perfect solid tube of India-rubber impermeable to water, I fix immediately under the reel from which the India-rubber is wound on the wire another small reel covered with flannel or some spongy substance, which I saturate with mineral ether or other solvent of India-rubber, in passing over which from its own reel to the wire the India-rubber is saturated with the solvent, which causes it to adhere to the India-rubber previously delivered, and thus becomes a solid tube. This is novel, and is part of the invention I now desire to patent.

I also adopt another process either seperately or in conjunction with the foregoing. After the wire is covered with the requisite number of coatings of India-rubber, I wind it on a grooved drum, and in this state immerse it in a boiling solution of bisulphate of potassa and sulphate of alumnia or of chloride of sodium, or muriate of soda, or sea, or other hot water, in which I boil it for a short time, by which means the tubing becomes solidified. This also is novel, and forms part of my patent.

For the outside covering of the wire or wires, when insulated either with India-rubber or gutta percha, I adopt the same plan of plaiting with hemp or other fibrous material as I used in the rope

across Portsmouth harbour, but my improvement is previously to apply a thin solution composed of metallic carbonates, or sulphates, or oxides mixed with some of the fixed oils either in conjunction with a volatile oil or alone, or I use a solution of what is known as Peacock & Buchan's composition for ships' bottoms, & which has been patented by those gentlemen, & which is now & has been for some years extensively used by the Peninsular & Oriental Steam Ship Company. I also apply over all a solution of shellac or other gum. By these means, which are novel & form part of my patent, I preserve the material which composes my exterior covering from decomposition or injury, from the action of the water, which otherwise would speedily rot, but which by this application will be preserved for many years.

The foregoing several processes are novel, for which, & their application, I now desire to take out letters patent.

121 Specification in pursuance of the conditions of the letters patent, filed by the said Charles West in the Great Seal Patent Office on the 16th April 1859.

To all to whom these presents shall come, I, Charles West, of No. 15, Mornington place, Camberwell new road, in the county of Surrey, gentleman, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the eighteenth day of October, in the year of our Lord one thousand eight hundred and fifty-eight, in the twenty-second year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Charles West, her special licence that I, the said Charles West, my executors, administrators, and assigns, or such others as I, the said Charles West, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the mode of insulating and covering wires," upon the condition (amongst others) that I, the said Charles West, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Charles West, do hereby declare the nature of my said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say:—

"For many years I have used India-rubber as a means of insulating wires or conductors of electricity. The submarine cable (containing a conducting wire) which I laid experimentally across Portsmouth harbour upwards of twelve years ago had the wire cov-

ered with this material. Gutta percha has been since introduced and used as an insulating material, but I prefer to use India-rubber. It is less impure than gutta percha, it does not soften at the same low temperature, and is altogether less affected by heat. Wires or conductors cannot, however, be coated with India-rubber in the same manner as they may be covered with gutta percha. In order to
122 obtain an effective and permanent covering of a wire or other conductor with India-rubber, I have found that the India-rubber must be wound spirally round the wire or conductor by machinery, and the tube or covering of India-rubber thus formed upon the wire or conductor is not solid, in consequence of the folds of India-rubber not effectually adhering together, and in many instances it has been found that the water permeated between the interstices between the several layers or folds of India-rubber thus injuring or destroying the insulation. To remedy this defect and to make a perfect solid tube or covering of India-rubber upon a wire or other conductor of electricity impermeable to water, I cause the folds of India-rubber to adhere together, as hereinafter described. I proceed in the first place to cover a wire or other conductor with flat strips or ribbons of India-rubber, which I wind spirally upon it by any of the well-known machinery used for covering wires; and I wind the strips or ribbons upon the wire or conductor in such manner that each circle or round of India-rubber strip covers or laps over about one-half of the previous round or circle of India-rubber, so as to ensure a good lap joint and effective covering to the wire or conductor to be insulated. I fix immediately under the reel from which the India-rubber is wound upon the wire or conductor by the machine, a small roller, the outside or periphery of which is covered with flannel or some spongy-fibrous substance. I cause the fibrous material upon the exterior of this roller to be kept saturated with mineral ether or other solvent of India-rubber during the whole time of the working of the machine by any convenient means. The strip of India-rubber as it passes from the reel to the wire or conductor passes over the roller, and its under side comes in contact with the roller so as to be thoroughly moistened with the solvent upon the exterior of the roller. In this way a sufficient quantity of the solvent is applied to the strips of India-rubber to cause the folds to adhere together and form a solid or continuous and impervious tube or covering upon the wire or other conductor. One, two, or more coverings may be put upon a wire or other conductor in this manner.

I also use another process for causing the surfaces of the strips of India-rubber to cohere, which consists in submitting the wire or conductor upon which the strips or ribbons of India-rubber have been wound to the action of moist heat, which I prefer to effect by plunging the covered wire or conductor into heated water. This may be done as follows:—After the wire or conductor has been covered with the coating or coatings of India-rubber, I wind it upon a drum having a spiral groove made upon it, so as to prevent the sides of the coils of the covered wire or conductor from com-
123 ing in contact with each other. Or the outer surface of the

India-rubber may be coated with Venetian or French chalk, or talc in powder, so as to prevent the India-rubber surfaces adhering together in case the covered wire or conductor be coiled or placed in such a position during the process that one part of the outer surface of India-rubber shall come in contact with some other part. The covered wire or conductor being wound upon a drum, or protected from external adhesion in the above or in any other convenient manner, is to be placed in a convenient vessel containing heated water. And if it be desired to have a temperature exceeding that of ordinary boiling water, the water may have common salt, alum, or any other salt dissolved in it, so as to raise the temperature of the boiling point of the liquid. I regulate the temperature and the time of immersion in the heated liquid according to the thickness and the number of coatings of the India-rubber, and the quality of the India-rubber which forms the insulating medium, examining the covering from time to time during the process in order to ascertain whether the requisite adhesion has been produced. A wire or other conductor covered in the manner firstly above described may also be subjected to the action of a moist heat in this way for the purpose of more effectually insuring the adhesion of the folds of India-rubber, and driving off the solvent or a portion of it, and so prevent the India-rubber from being too soft or plastic.

For the purpose of preserving one or more wires or conductors when laid or placed in the interior of a rope or cable, I use a covering composed of hemp or other fibrous material saturated with a composition consisting of some one or more of the metallic carbonates or oxides mixed with some of the fixed oils, either alone or in conjunction with a volatile oil, or saturated with (what I prefer) a solution of what is known as Peacocks and Buchan's composition for ships' bottoms (which I believe has been patented by those gentlemen) and which is now and has been for some years extensively used by the Peninsular and Oriental Steam Ship Company.

In the formation or construction of an electric telegraph cable or rope for submarine or subterranean or superterranean purposes composed of one or a plurality of wires I adopt the following process: If the cable is to be constructed with a plurality of wires, I lay up the number of insulated wires or conductors required into a rope or cable, in like manner as several wires or strands are laid into a rope in rope making, each strand being composed of a separate and distinct insulated wire or conductor. I surround this rope with yarns of hemp or other fibrous material saturated with the compositions before adverted to, which I wind round the rope in a spiral form,
124 and then I enclose the whole in a plaiting of yarns of hemp or other fibrous material saturated with the same or a similar composition. If the cable is to be constructed with only one insulated wire or conductor, I lay it together with two or more strands of hempen or other yarns, into a rope in manner above mentioned, the hempen or other yarns being saturated with a composition such as already described. The insulated wire or conductor in such a case forms one of the strands of the rope, and the hempen or other yarns form the other strands of the rope. The rope so formed I

enclose in plaiting in like manner as above mentioned, and the cable is then complete. Or I enclose it in hempen or other fibrous yarns prepared with a composition such as before described wound specially round it. For some purposes, when it is not likely there will be any very great strain upon a rope or cable containing a single insulated wire or conductor, the laying it into a rope with other strands, as above mentioned, may be dispensed with; and then I cover or surround the insulated wire or conductor with yarns of hemp or other fibrous materials saturated with a composition such as above mentioned, and wound round the insulated wire or conductor in like manner as above mentioned with respect to a rope containing several wires or conductors, after which I enclose the whole in a plaiting of yarns saturated with composition in like manner as above described.

When it is necessary that a rope or cable containing one or more wires or conductors should have extraordinary or great strength, I give it two or more of the plaited coverings of saturated yarns, as above described.

When a cable or rope has been completed in any of the modes above mentioned, I prefer to give it a coating of shell-lac or other similar gum in solution, in order to assist in preserving it and rendering it more impermeable.

Having described and ascertained the nature of my said invention, and the manner in which it may be performed, I declare that I claim as of my said invention,—

First, the mode of applying a solvent to the India-rubber covering of a wire or other conductor of electricity, as above described, for the purpose of causing the folds of India-rubber to adhere together, and effecting a more perfect insulation of the wire or conductor.

Second, the mode of subjecting the India-rubber covering of a wire or other conductor of electricity to the action of a moist heat, as above, for the purpose of causing the folds of India-rubber to adhere together, and effecting a more perfect insulation of the wire or other conductor.

Third, the covering of insulated wires or conductors with
125 yarns of fibrous material saturated with a composition, as hereinbefore described, for the purpose of preserving such fibrous material, and causing it more effectually to protect the insulated wires or conductors from injury.

In witness whereof, I, the said Charles West, have hereunto set my hand and seal, this sixteenth day of April, in the year of our Lord one thousand eight hundred and fifty-nine.

CHARLES WEST. [L. S.]

Signed, sealed, and delivered by the above-named Charles West, in the presence of

J. GODFREY HUMPHRY,
Clerk to Messrs. Wilde & Co, College Hill, London.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1859.

126 DEFENDANT'S EXHIBIT CHATTERTON AND SMITH PATENT, No. 2056 OF 1860. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1860, 25th August. No. 2056.

Specification of John Chatterton and Willoughby Smith.

Telegraphic cables.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1861. Price 3*d*.

127 [British coat of arms.]

A. D. 1860, 25th August. No. 2056.

Telegraphic Cables.

(This invention received provisional protection only.)

Provisional specification left by John Chatterton and Willoughby Smith at the office of the commissioners of patents, with their petition, on the 25th August 1860.

We, John Chatterton, of Highbury terrace, and Willoughby Smith, of Pownall road, Dalston, both in the county of Middlesex, do hereby declare the nature of the invention for "improvements in the manufacture of telegraphic cables," to be as follows:—

This invention has for its object improvements in the manufacture of telegraphic cables. For these purposes, in order that the gutta percha insulating coatings should not be subjected to heat in the process of manufacturing a cable, as has heretofore been the case when applying hot pitch, rosin, and other matters, together with or after the fibrous materials and wire coatings have been applied around the gutta percha coated wires. We apply oxides or carbonates of lead, or other preparation of that or other metal combined with oil or varnish, together with the fibrous materials used externally of the insulating gutta percha coatings, whether wire be employed, as well as fibrous materials, to give strength to the cable or not. For these purposes the fibrous materials used, whether made up in the form of tape, yarn, cord, or otherwise, is coated or saturated with the paint or composition above mentioned, and by preference in the act of applying such fibrous materials, and whether such fibrous materials are wound spirally around, or laid longitudinally over the surfaces of the gutta percha; and it is preferred to bind an

uncoated tape exterior of the saturated coatings of fibre, in order that the cable may be at once coiled.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1861.

128 DEFENDANT'S EXHIBIT CHATTERTON AND SMITH PATENT, No. 175 of 1861. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1861, 22nd January. No. 175.

Specification of John Chatterton and Willoughby Smith.

Telegraphic cables.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1861.

Price 4*d*.

129 [British coat of arms.]

A. D. 1861, 22nd January. No. 175.

Telegraphic Cables.

Letters patent to John Chatterton, of Highbury terrace, and Willoughby Smith, of Pownall road, Dalston, both in the county of Middlesex, for the invention of "improvements in the manufacture of telegraphic cables."

Sealed the 2nd April 1861, and dated the 22nd January 1861.

Provisional specification left by the said John Chatterton and Willoughby Smith at the office of the commissioners of patents, with their petition, on the 22nd January 1861.

We, John Chatterton, of Highbury terrace, and Willoughby Smith, of Pownall road, Dalston, both in the county of Middlesex, do hereby declare the nature of the invention for "improvements in the manufacture of telegraphic cables," to be as follows:—

This invention has for its object improvements in the manufacture of telegraphic cables. For these purposes in order that the gutta percha insulating coatings should not be subjected to heat in the process of manufacturing a cable, as has heretofore been the case, when applying hot pitch, rosin, and other matters, together

with or after the fibrous materials and wire coatings have
130 been applied around the gutta percha coated wires, we apply oxides or carbonate of lead or other preparation of that or other metal combined with tar, oil, or varnish, together with the fibrous materials used externally of the insulating gutta percha coatings, whether wire be employed as well as fibrous materials to give strength to the cable or not. For these purposes the fibrous materials used, whether made up in the form of tape, yarn, cord, or otherwise, is coated or saturated with the paint or composition above mentioned; and by preference in the act of applying such fibrous materials, and whether such fibrous materials are wound spirally around or laid longitudinally over the surfaces of the gutta percha, and it is preferred to bind an uncoated tape exterior of the saturated coatings of fibre in order that the cable may be at once coiled.

Specification in pursuance of the conditions of the letters patent, filed by the said John Chatterton and Willoughby Smith in the Great Seal Patent Office on the 22nd July 1861.

To all to whom these presents shall come, we, John Chatterton, of Highbury terrace, and Willoughby Smith, of Pownall road, Dalston, both in the county of Middlesex, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twenty-second day of January, in the year of our Lord one thousand eight hundred and sixty-one, in the twenty-fourth year of her reign, did, for herself, her heirs and successors, give and grant unto us, the said John Chatterton and Willoughby Smith, her special licence, that we, the said John Chatterton and Willoughby Smith, our executors, administrators, and assigns, or such others as we, the said John Chatterton and Willoughby Smith, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in the manufacture of telegraphic cables," upon the condition (amongst others) that we, the said John Chatterton and Willoughby Smith our executors or administrators, by an instrument in writing under our, or their hands and seals, or under the hand and seal of one — us or them, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to
131 be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that we, the said John Chatterton and Willoughby Smith, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

This invention has for its object improvements in the manufacture of telegraphic cables. For these purposes in order that the gutta percha insulating coatings should not be subjected to heat in the process of manufacturing a cable, as has heretofore been the case, when applying hot pitch, rosin, and other matters together with or after the fibrous materials and wire coatings have been applied around the gutta percha coated wires, we apply oxides or carbonates of lead or other preparation of that or other metal combined with tar, oil, or varnish, together with the fibrous materials used externally of the insulating gutta percha coatings, whether wire be employed as well as fibrous materials to give strength to the cable or not. For these purposes the fibrous materials used, whether made up in the form of tape, yarn, cord, or otherwise, is coated or saturated with the paint or composition above mentioned, and by preference in the act of applying such fibrous materials, and whether such fibrous materials are wound spirally around or laid longitudinally over the surfaces of the gutta percha, and it is preferred to bind an uncoated tape exterior of the saturated coatings of fibre in order that the cable may be at once coiled.

Having thus stated the nature of our invention, we will proceed more fully to describe the manner of performing the same.

We prepare a paint, by preference of oxide of lead (red lead), though carbonates or other preparations of lead may be used, or oxides or other preparations of other metals suitable for paint may be employed in place thereof with boiled linseed oil, or it may be varnish or other suitable fluid, such as Stockholm tar, taking care to avoid the use of turpentine and other fluids which are solvents of or act injuriously on gutta percha. We would state that we make no claim to the paints above mentioned, they separately and apart from their use in carrying out our invention not being new. The peculiarity of our invention consists, in the manner in which such paints are used in combination with fibrous materials in the manufacture of telegraph cables, whether wire be applied or not to give strength to such electric telegraph cables.

The electric conductor (whether consisting of a strand of
132 metal wires or otherwise formed) is first coated with gutta percha, as heretofore; and when wire is not used to give strength to such gutta percha covered conductor, it is coated with fibrous materials coated or saturated with the paint above mentioned. The fibrous materials may be in the form of tape, yarn, cord, or otherwise, and the most convenient manner of performing this process is to cause the tapes or yarns, or cords, or other forms into which the fibre is manufactured, to pass through a bath of such paint immediately previous to their being paid or served, or otherwise applied either longitudinally or spirally, or both, around the gutta percha; and there may be one or more layers of such coated or saturated fibrous matters employed on or around the gutta percha covered electric conductor.

When iron or steel wires are used to give strength to the electric telegraph cable, whether such wires be laid around spirally or longitudinally, we prefer that they should each be first covered with

fibrous materials saturated or coated with the paint above-mentioned, and this may, we believe, be most advantageously performed by causing each wire to pass through a bath of the paint above mentioned as it is about to be paid, or served, or otherwise coated with tape, cord, or yarn, or other suitable preparation of fibre, and the tapes, cords, yarns, or other preparations of fibres thus used on the wires should be also passed through a bath of or be otherwise coated with the paint above mentioned, as the same are applied to the wires, by which means the paint will be wet both on the wires and on the preparations of fibrous materials as they are brought together.

When the preparation of fibrous materials saturated or covered with the paint is not to be wound round or otherwise applied to the individual wires used to give strength to a telegraphic cable, then the gutta percha core containing the electric conductor is first to have the wires laid or otherwise applied thereto as heretofore, and is then to be coated with fibrous materials suitably prepared in the form of tape, cord, or yarn, or otherwise, and coated or saturated with the paint above mentioned, and the same applied over the wires by serving or otherwise either one or more layers thereof on to the cable, which we believe may be most conveniently done by causing the cable to pass through a bath of the paint, and the preparation of fibrous material, whether tape, cord, yarn, or otherwise coated or saturated with the paint, is applied whilst the paint on both are wet; and we then apply over the same another coating of tape or other preparation of fibres which has not been coated with the paint.

We would remark, that we make no claim to the use of
133 fibrous materials when uncombined with the paint, whether applied to the individual wires of an electric telegraph cable or to the wires after they have been applied to the core of gutta percha containing the electric conductor.

In witness whereof, we, the said John Chatterton and Willoughby Smith, have hereunto set our hands and seals, this twenty-second day of July, in the year of our Lord one thousand eight hundred and sixty-one.

JOHN CHATTERTON. [L. S.]
WILLY. SMITH. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1861.

134 DEFENDANT'S EXHIBIT FOUCAUT PATENT. F. C. E, N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1869, 2nd July. No. 2008.

Specification of Alfred Foucaut.

Telegraphic cables.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1870. Price 6*d*.

135 [British coat of arms.]

A. D. 1869, 2nd July. No. 2008.

Telegraphic cables.

Letters patent to Alfred Foucaut, of Orleans, France, medical doctor, for the invention of "improvements in telegraphic cables."

Sealed the 1st January 1870, and dated the 2nd July 1869.

Provisional specification left by the said Alfred Foucaut at the office of the commissioners of patents, with his petition, on the 2nd July 1869.

I, Alfred Foucaut, of Orleans, France, medical doctor, do hereby declare the nature of the said invention for "improvements in telegraphic cables," to be as follows:—

In making a cable of one or more conductors I use as conductors single copper or other metallic wires, or I twist several smaller wires together to form one conductor of the proper size. I cover each conductor with a coating of gutta percha or other insulating material, such as a compound of paraf-ine, and I wrap a cotton thread on to completely cover the gutta percha; or instead of the gutta percha I employ a composition of ceruse or carbonate of lead, finely
136 powdered, and mixed with litharged oil and sawdust to the proper consistency; I then cover the gutta percha or composition already described with a metallic conducting coating. I use preferably a coating of plumbago applied by friction, or a coating of tinfoil; or I wrap a small copper or other metallic wire in long spirals around the gutta percha or composition. Any conductor properly applied will answer the same purpose. This metallic surface or wire is connected with the ground at each end of the cable,

or at any other point or points that may be required to carry off or properly employ and control all induced currents of electricity. I then saturate a linen band with a mastic composed of ceruse or carbonate of lead, finely powdered, and mixed with litharged oil and paraffine to a proper consistency, and I wrap the linen band so prepared around each conductor already covered, as above described, each turn of the band lapping over the previous turn. The different conductors are then brought together and wrapped with the same band, and over all is wrapped a tarred rope of the thickness desired, which is covered with a coating of coal tar, and over this is wrapped a linen band tarred as usual. Cables for submarine use may be afterwards armoured as usual with iron wires of a size suitable to the locality and the work which they have to perform. I am aware that a metallic coating consisting of a metallic strip wound around the insulating material is not new, but the said metallic strip has been used as a conductor of the main current; this differs from my invention in that my metallic coating acts as a conductor for the induced current alone, or is intended to be used when several conductors are grouped together. It is also an important feature of my invention that the conductor should be placed in connexion with the earth, my method of applying the metallic coating is believed to totally destroy the effects of induction, and is of great efficiency in increasing the transmitting power in submarine cables.

Specification in pursuance of the conditions of the letters patent, filed by the said Alfred Foucaut in the Great Seal Patent Office on the 1st January, 1870.

To all to whom these presents shall come, I, Alfred Foucaut, of Orleans, France, medical doctor, send greeting:

137 Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the second day of July, in the year of our Lord one thousand eight hundred and sixty-nine, in the thirty-third year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Alfred Foucaut, her special licence that I, the said Alfred Foucaut, my executors, administrators, and assigns, or such others as I, the said Alfred Foucaut, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in telegraphic cables," upon the condition (amongst others) that I, the said Alfred Foucaut, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Alfred Foucaut, do hereby declare

the nature of my said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the drawings hereunto annexed, that is to say:—

In making a cable of one or more conductors I use as conductors single copper or other metallic wires, or I twist several smaller wires together to form one conductor of the proper size. I cover each conductor with a coating of gutta percha or other insulating material, and I wrap a cotton thread upon it so as to completely cover the gutta percha, or I form a composition of ceruse or carbonate of lead finely powdered and mixed with litharge oil and sawdust to the proper consistency, which is to be applied in the same manner and in lieu of the gutta percha: I then cover the gutta percha or the composition and cotton threads with a metallic conducting coating. I use preferably a coating of plumbago applied by friction, or a coating of tin or other metal foil; or I wrap a small metal-
138 lic wire in long spirals around the gutta percha or composition and cotton. Any other kind of conductor if properly applied will answer the same purpose. This metallic surface or wire is connected, if necessary, with the earth at each end of the cable, or at any other point or points that may be desired to carry off or properly employ and control all earth or induced currents of electricity. I then saturate a linen band with a mastic composed of ceruse or carbonate of lead finely powdered and brought to a proper consistency by mixing litharge oil therewith, and I wrap the linen band so prepared around the conductor or conductors already covered as above described, each turn of the band lapping over the previous turn. Several conductors are then brought together to form a cable, and wrapped with a band, over which a tarred rope or cord of the thickness desired is "served" or wrapped. The rope or cord is covered with a coating of coal tar or other preserving agent, and to protect this I wrap a linen band which is tarred as usual or painted over with a solution of caoutchouc (indianite). Cables for submarine use may be afterwards armoured as usual with wires of a size suitable to the locality and the work which they have to perform.

In order to make a cable of great resisting power I replace each of the copper conductors with a steel wire, which is isolated like the copper wire in order to protect its magnetization from the influence of currents. In the formation of these cables I attach great importance, 1st, to the interposition between the several conductors of a metallic partition for collecting the earth or induction current or currents and constituting the best means of isolation; and, secondly, the employment of the ceruse as possessing the property of hardening during its immersion in water; the covering of ceruse therefore protects the gutta percha more and more from the action of the air and water, and it thus follows that the older the cable the better the copper or conducting wire is enclosed.

The drawing hereunto annexed

(Here follows diagram marked p. 141.)

shows at figure 1 a portion of my cable at different stages of its manufacture; figure 2 shows, by way of example, a transverse section of a cable composed of seven conductors. Each conductor *a* is composed of one, two, three, four, or a greater number of wires of copper either spun or interlaced to form a stout body. Each conducting wire is surrounded with gutta percha *b*, and upon the latter is rolled an envelope of cotton
139 thread or fibre *c* impregnated or coated with ceruse. It is above this cerused cotton that a sheet of thin tin *d* or other metal foil is applied, cut into bandelets of about one-third of an inch in breadth, which are rolled or wrapped into spirals either by the hand or mechanically upon each conducting wire. The conductors thus prepared are then united into a sheaf or cable core, and this sheaf or cable core may be covered with ceruse, gutta percha, or other isolating material or compound capable of hardening, and which will fill all interstices. I then take a strip of linen *e* saturated with a mastic of ceruse, and I envelope the sheaf or cable core with this band. The whole is then served with a tarred rope or cord *g*, and then finally covered with a tarred cloth *h*. In this system the metallic partitions form distinct compartments (see figure 2) and completely isolate each of the conductors *a*. The ceruse, ceruse mastic, or other compound is enclosed within the metallic partitions *d*, and there solidifies in the form of a sort of trapezium.

And having now described the nature of my said invention, and in what manner the same is to be performed, I declare that I claim,—

Firstly. The general construction of a telegraphic cable, substantially in the manner described.

Secondly. A conducting surface for induction currents and insulation when applied to the outside of the insulating coating of each group of conductors or of one conductor, in the manner and for the purpose described.

Thirdly. The employment of a band saturated with a mixture or compound of ceruse, or carbonate of lead, and litharge, or other oils when arranged in telegraphic cables, in the manner and for the purpose herein described.

Fourthly. In telegraphic cables the construction of the coatings formed of gutta percha or compositions, the metallic conducting surface, the cotton thread, the band saturated with mastic of carbonate of lead or ceruse, and the tarred rope, arranged in the manner and for the purpose described.

Fifthly. I claim as an insulating material used in the construction of telegraphic cables the composition composed of carbonate of lead or ceruse or other similar hardening substance, litharge
140 or other oil, sawdust, or other analagous fibrous substance, in the manner and for the purpose described.

In witness whereof, I, the said Alfred Foucaut, have hereunto set my hand and seal, the eighteenth day of December, in the year of our Lord one thousand eight hundred and sixty-nine.

ALFRED FOUCAUT. [L. S.]

Witness,

CH. ARMENGAUD,

Civil Engineer, 23, Boulevard de Strasbourg, à Paris.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1870.

142 DEFENDANT'S EXHIBIT HIGHTON PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin clerk.

[British coat of arms.]

A. D. 1872, 27th August. No. 2547.

Specification of Henry Highton, M. A.

Submarine cables, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1873. Price 4*d*.

143 [British coat of arms.]

A. D. 1872, 27th August. No. 2547.

Submarine Cables, &c.

Letters patent to Henry Highton, M. A., of Putney, in the county of Surrey, for the invention of "improvements in submarine and other cables for the conveyance of electricity."

Sealed the 1st November 1872, and dated the 27th August 1872.

Provisional specification left by the said Henry Highton at the office of the commissioners of patents, with his petition, on the 27th August 1872.

I, Henry Highton, M. A., of Putney, in the county of Surrey, do hereby declare the nature of the said invention for "improvements in submarine and other cables for the conveyance of electricity," to be as follows:—

This invention has for its object improvements in submarine and other cables for the conveyance of electricity. For this purpose I apply to the insulated conducting wire over the insulatory coating of gutta percha, India-rubber, or similar material, a coating of boiled linseed oil or other drying oil, mixed with a pigment,
144 by preference red lead. When this coating is thoroughly set I apply the outer strands of the cable around the conductor in the usual manner.

The coating of boiled oil and red lead fills any minute pores in the insulator, and greatly improves the insulaton, and in many cases a single thin covering of gutta percha thus coated will suffice to give a practically perfect and durable insulation.

Specification in pursuance of the conditions of the letters patent, filed by the said Henry Highton in the Great Seal Patent Office on the 26th February 1873.

To all to whom these presents shall come, I, Henry Highton, M. A., of Putney, in the county of Surrey, send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the twenty-seventh day of August, in the year of our Lord one thousand eight hundred and seventy-two, in the thirty-sixth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Henry Highton, her special license that I, the said Henry Highton, my executors, administrators, and assigns, or such others as I, the said Henry Highton, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in submarine and other cables for the conveyance of electricity," upon the condition (amongst others) that I, the said Henry Highton, my executors or administrators, by an instrument in writing under my, or their, or one of their hands or seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Henry Highton, do hereby declare the nature of the said invention, and in what manner the
145 same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

This invention has for its object improvements in submarine and other cables for the conveyance of electricity. For this purpose I apply to the insulated conducting wire over the insulatory coating of gutta percha, India rubber, or similar material, a coating of boiled linseed oil, or other drying oil, mixed with red lead. Or in place of a drying oil I have found that vegetable tar which contains oils suitable for the purpose may be employed, and litharge (another oxide of lead) may be used instead of red lead.

It is advantageous to mix together tar and oil, and to use a diluent, such as nap-tha or turpentine, to keep the composition sufficiently fluid, and to enable it to combine more thoroughly with the surface of the insulator. The consistence should be that of ordinary oil paint. The exact proportions of the ingredients is not important and may be conveniently varied to suit the convenience of application.

It will be a sufficient guide in practice to bear in mind that the tar gives hardness to the compound and the oil elasticity, but that they may be used either of them, alone or combined, in any proportions. I find that nap-tha or turpentine, to the extent of from 15 to

30 per cent. by measure, acts as a sufficient diluent of the tar. The red lead or litharge should be used in sufficient quantity to coat fairly the surface of the insulator. Other oxidising pigments, such as oxide of iron or manganese, have partially the same effect as the oxide of lead, but are not nearly so good. The gutta percha or India-rubber coated conductor is passed through the composition, which is used cold. Or the coated conductor may be passed through tar, or a mixture of tar and oil, and then red lead may be dusted or brushed over it, and so the composition may be produced upon the surface of the insulated conductor.

After the composition is applied, I apply, if thought necessary, first another coating of gutta percha or India-rubber, and then the outer strands or the cable around the conductor in the usual manner, or the outer strands may be applied immediately over the composition.

The composition fills any minute pores in the insulator, and greatly improves the insulation, and in many cases a single thin covering of gutta percha thus coated will suffice to give a
146 practically perfect and durable insulation. Sometimes I coat the conductor with the composition before applying the insulator.

What I claim is the use in the construction of submarine and other cables for the conveyance of electricity of compositions substantially as described to fill any minute pores in the insulator, or to improve the insulation.

In witness whereof, I, the said Henry Highton, have hereunto set my hand and seal, this twentieth day of February, in the year of our Lord one thousand eight hundred and seventy-three.

HENRY HIGHTON. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1873.

147 DEFENDANT'S EXHIBIT WILKINSON PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

Offered by def't & allowed in circuit court. Attest: E. E. Marvin, clerk. Offered & allowed in the circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1873, 19th September. No. 3083.

Specification of Alexander Wilkinson.

Coating and preserving telegraph wires, &c.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the

Great Seal Patent Office, 25, Southampton buildings, Holborn. 1874.

Price 4*d*.

148 [British coat of arms.]

A. D. 1873, 19th September. No. 3083.

Coating and Preserving Telegraph Wires, &c.

Letters patent to Alexander Wilkinson, of No. 41, Great Marylebone street, Portland Place, in the county of Middlesex, engineer, for the invention of "improvements in coating and preserving telegraph wires, ropes, and cables."

Sealed the 5th December 1873, and dated the 19th September 1873.

Provisional specification left by the said Alexander Wilkinson at the office of the commissioners of patents, with his petition, on the 19th September 1873.

I, Alexander Wilkinson, of No. 41, Great Marylebone street, Portland Place, in the county of Middlesex, engineer, do hereby declare the nature of the said invention for "improvements in coating and preserving telegraph wires, ropes, and cables," to be as follows:—

This invention relates, firstly, to coating and preserving telegraph wires, and consists in coating the fabric, covered wire, with a solution of white lead, pitch, boiled or raw, linseed oil, tallow, and nap-tha, the ingredients being mixed in suitable proportions, and
149 heated so as to make, after the coating is effected and exposed to the atmosphere, a comparatively hard yet flexible exterior, perfectly waterproof, and capable of withstanding extreme cold without becoming rigid or liable to crack.

In lieu of using pitch, rosin or tar can be mixed with the white lead, oil, tallow, and nap-tha, the proportion being about the same as for the first method.

The invention relates, secondly, to coating a number of threads, filaments, strips, or sheets of fabric to cover the above wires, and consists in passing them, *i. e.*, the threads through a bath containing white lead, pitch, and boiled or raw linseed oil, first rendered into a plastic body by heat, and then allowed to cool down before the filamentous bodies are passed through the coated filaments, are then when dry wrapped round the other wire arranged upon a rope or cable composed of a series of the first-mentioned coated wires, and then passed through a bath of the last-mentioned ingredients in a heated or a cold state, whereby the thread-covered rope or cable becomes coated, and all the interstices of the wrapping filled in. The rope or cable is then run through a bath of white lead in solution to give it a final exterior coating in order to render it both fireproof and waterproof.

The invention consists, thirdly, in first coating by dipping or otherwise threads or filaments in a solution of white lead, pitch, or

its equivalent, and boiled linseed oil, and then exposing them until they become dry. These threads are then wrapped onto the bare wires, which are afterwards further coated by lead, "compo," tin, or other metal, which can be "drawn," the coated wires acting as the mandril, onto which the metal is drawn.

The second part of my invention is specially applicable for land lines, both overhead and underground, but it may be used in connection with submarine lines if desired.

150 Specification in pursuance of the conditions of the letters patent, filed by the said Alexander Wilkinson in the Great Seal Patent Office on the 19th March 1874.

To all to whom these presents shall come, I, Alexander Wilkinson, of No. 41 Great Marylebone street, Portland Place, in the county of Middlesex, engineer, send greeting:

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the nineteenth day of September, in the year of our Lord one thousand eight hundred and seventy-three, in the thirty-seventh year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Alexander Wilkinson, her special licence that I, the said Alexander Wilkinson, my executors, administrators, and assigns, or such others as I, the said Alexander Wilkinson, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in coating and preserving telegraph wires, ropes, and cables," upon the condition (amongst others) that I, the said Alexander Wilkinson, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Alexander Wilkinson, do hereby declare the nature of my said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

This invention relates to the combination of certain ingredients and in suitable quantities or proportions to form a protecting and a preserving coating or covering to telegraphic wires, ropes, and cables; also to fabrics, fibres, and filaments when applied thereto; also to the method of treating such wires, by which the coating is effected.

151 The ingredients are white lead, pitch, japan, shellac, tallow, naphtha, and oil, to which in some cases a small proportion of glycerine, gutta percha, or litharge is added.

Instead of pitch, rosin or tar can be used, and instead of shellac, a varnish or other body having similar properties.

To coat or cover naked wires used for telegraphic purposes according to my invention I first clean the surfaces of the wires and then pass them through a bath of Brunswick black or of gutta percha, diluted in order to prepare them for the after coatings or coverings. I then cover the wires with fibres or filaments, which have been prepared in a bath composed of—

White lead,	say,	one pound,
Pitch	"	four ounces,
Japan	"	one ounce,
Shellac	"	three ounces,
Tallow	"	one ounce,
Naphtha	"	one ounce,
Oil (linseed)	"	one ounce;

these having been previously mixed gradually under the action of heat and then allowed to cool down. The wire thus coated by the composition just named are then exposed to the atmosphere for some time, and are then passed through a second bath composed of the same ingredients in a heated state in order that the interstices of the fibres or filaments may be completely filled up, and the wires be perfectly insulated. After this is accomplished I pass the coated wires through a bath of white lead or one or more of the ingredients before referred to to give them a final covering, and thereby fit them to be used for telegraphic purposes generally.

When I wrap fibres or filaments onto the wires I dispense with the first coating of Brunswick black and then I pass the untreated fibred wires through the bath until the fibres are completely saturated and coated with the compound, they being afterwards coated with white lead or other bodies in combination as before mentioned.

If the wires to be coated are very soft in "temper" I add a small quantity of glycerine to the bath to make the compound the more flexible, and to thereby maintain the pliability, but only in rare cases would the glycerine be needed, as the flexibility of the coated wires would be governed, more or less, by the thickness of the coating or the number of coatings applied.

152

The coating after exposure to the atmosphere becomes comparatively hard, it is perfectly waterproof, and is capable of withstanding extreme cold without liability to crack or flake off.

In making up a rope or cable I take one or a number of wires, which have been coated as above described, and pass them through a bath of the same ingredients and similarly prepared, so that they become coated to the desired thickness, or I first wrap the series of coated wires with a fibrous body prepared or not as described to form a proper cable, and then pass this rope or cable through the bath.

In some cases I use a bath composed of the before-mentioned ingredients in a cold state for coating wires, ropes, or cables, exposing them afterwards until they become dry.

The single coated wires, such as are preferable for land or overhead telegraphy, can be covered or enclosed in a soft metal or a metallic compound "drawn" into a tube in the manner well known,

and the rope or cable for submarine telegraphy can have iron or other wire or sheet lead in strips wound, twisted, or braided upon it, and in most cases I coat the metal covering with prepared filaments or fibres, and then finally coat them with the composition before passing them through the bath containing the ingredients before mentioned.

I have referred to fibres and filaments as being saturated or coated with the compound prior or subsequent to their application to the wires, and such fibres or filaments may be in fleece, in yarn, or in thread, and either loose or woven as a fabric, in which case the fabric may be in strips, in sheets, or pieces. If they are in strips they can be used as wrappings to the wires or to the ropes or cables, and if in sheets or pieces for other purposes, such as for covering goods, roofings, or the like.

In the composition I have referred to shellac as one of the ingredients used, but I do not limit myself thereto as varnish, gutta percha, or other similar sticky binding body can be substituted for it, neither do I limit myself to employing pitch, as rosin or tar or India-rubber mixed with the ingredients before mentioned is equally applicable.

153 My invention further consists in the employment of a mixture composed of white lead and boiled oil and gutta percha, which when well boiled together form a coating applicable for the protection of submarine and land telegraph wires, ropes, and cables, the wire, rope, or cable being drawn through a bath containing the ingredients, as before mentioned, they are placed in a bath or tank containing hot water or steam, and then drawn through dies by pressure in order to compress and thus fill up the open pores of the ropes, strands, or cables.

What I claim as my invention is, coating and preserving telegraph wires, ropes, and cables, also fabrics and filaments as set forth by a composition composed of white lead, pitch, or in lieu thereof, rosin or tar, japan, shellac, or its equivalent, tallow, naphtha, India-rubber, or gutta percha, and oil in or about the proportions described.

I also claim the use as hereinbefore described of metal or a metallic compound drawn into a tube over and above the coating, as hereinbefore set forth, for the further protection and preservation of telegraph wires, ropes, and cables.

In witness whereof, I, the said Alexander Wilkinson, have hereunto set my hand and seal, this eighteenth day of March one thousand eight hundred and seventy-four.

ALEX. WILKINSON. [L. S.]

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1874.

154 DEFENDANT'S EXHIBIT WALKER PATENT. F. C. E., N. P. March 17, 1886.

ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1870, 31st January. No. 274.

Specification of Thomas Walker.

Insulating telegraph conductors.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1870. Price 4*d*.

155 [British coat of arms.]

A. D. 1870, 31st January. No. 274.

Insulating Telegraph Conductors.

(This invention received provisional protection only.)

Provisional specification left by Thomas Walker at the office of the commissioners of patents, with his petition, on the 31st January, 1870.

I, Thomas Walker, of Robert street, Chelsea, in the county of Middlesex, do hereby declare the nature of the said invention for "improvements applicable to telegraphic purposes," to be as follows:—

In order to ensure insulation I cover electrical conductors with gutta percha or India-rubber dissolved in nap-tha or other volatile solvent, either pure or mixed with gums, resins, pitch, bitumen, paraf-ine, or any other water-resisting substance, and lampblack, powdered glass, or fine sand, either in combination or singly. I evaporate the solvent by heat or in the air, or I use any kind of oil, varnish, or paint mixed with any pigment, or the above-mentioned substances alone or combined without the gutta percha or India-rubber.

In using an inferior insulating material two or more conductors are laid connected with the batteries and instruments to form a complete metallic circuit, and one conductor is used to serve as a return to any number of lines.

156 Two or more uninsulated conductors are used connected in the same way to form the circuit or circuits.

I use a conductor or conductors insulated with gutta percha or India-rubber in the usual way, and any number of uninsulated lines

in circuit with them. I use the conductors covered with any suitable fibrous materials, such as cotton, jute, Manilla, hemp, or cocoanut fibre, or similar substances, or I use them without such covering. When necessary I cover the whole or part of them with a metallic sheathing in the usual way.

In some cases I use a galvanometer (horizontal) with a reflector attached to the needle, and with or without a stop or stops placed so that the needle may move in one direction only, the reflector to be placed edgeways to the light. When at rest no light will be thrown on the screen, but when in use the light will be short or long according to the length of time appointed to the transmitting key. For sending currents I use in some cases a transmitting key with two levers. I divide the bridge into two parts. I attach the receiving instrument to each part of the bridge, and when sending currents I use a plug to connect the two parts of the bridge. I use the plug with or without a lever attached.

I use a register or recording instrument with suitable machinery causing pointers or levers to pass over the sending and receiving materials, which I prepare by the usual chemical processes; or I make the pointers hollow, so that liquid colouring matter will flow to make marks when pressed by electro-magnets. In some cases I use ink-marking discs, black leads, or other marking substances.

For the sending apparatus I use characters either written with insulating materials upon metallic surfaces or type set up. With cables and lines as above described I use any of the usual instruments when desirable.

For land lines I use a buried or partly buried line for the return instead of earth plates. Any number of lines may be connected with the buried line.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1870.

157 DEFENDANT'S EXHIBIT BALESTRINI PATENTS. F. C. E., N. P. March 17, 1886.

THE ANSONIA BRASS & COPPER CO.
vs.
THE ELECTRICAL SUPPLY CO.

In evidence in circuit court. Attest: E. E. Marvin, clerk.

[British coat of arms.]

A. D. 1856. No. 2124.

Specification of Pier Alberto Balestrini.

Electric telegraphs.

London: Printed by George E. Eyre and William Spottiswoode, printers to the Queen's most excellent majesty: Published at the Great Seal Patent Office, 25, Southampton buildings, Holborn. 1857. Price 7*d*.

158 [British coat of arms.]

A. D. 1856. No. 2124.

Electric Telegraphs.

Letters patent to Pier Alberto Balestrini, of Brescia (Italy), for the invention of "improvements in protecting and laying telegraphic wires."

Sealed the 25th November 1856, and dated the 11th September 1856.

Provisional specification left by the said Pier Alberto Balestrini at the office of the commissioner of patents, with his petition, on the 11th September 1856.

I, Pier Alberto Balestrini, of Brescia (Italy), do hereby declare the nature of the invention for "improvements in protecting and laying telegraphic wires," to be as follows:—

This invention has for its object a method of protecting telegraph wires for submarine and other communication. The telegraphic wires are insulated by gutta percha or vulcanized India-rubber, or they are inclosed in cords of hemp or other fibre rendered waterproof by a mixture of India-rubber and pitch. The wires, thus protected, form the core of the telegraphic cable; they are either laid parallel to each other, or they are laid spirally on a core of fibre or of iron wire covered with fibre. Eight or other number of cords of hemp or other fibre waterproofed with the composition before mentioned are then closely wound in a spiral direction round this core, and the cable so formed is consolidated by passing it between grooved rollers. If the cable is intended for use under a considerable depth of water, it is strengthened by coiling
159 round it (in the opposite direction to the coils of the cords) iron wires in long open spirals, and over these wires the cable is wound round closely with galvanized iron wire, and by the action of the galvanized wire on the non-galvanized wire a calcareous deposit is produced round the cable after it has been immersed for some time, by which it is much protected. Sometimes, with a similar object, strips of zinc are laid longitudinally of the cable under the wire coating. In places where the cable is likely to come in contact with rocks, it is protected by having steel wire wound round it.

To facilitate the laying of the cable, a description of parachute is attached to it at intervals, which parachute is so arranged, that when the cable enters the water the parachute opens, and prevents the cable from being drawn violently through the water. To protect wires, to be used suspended from posts or otherwise, they are enclosed in cords of hemp or other fibre, waterproofed with the composition before mentioned, and afterwards painted with zinc white.

Specification in pursuance of the conditions of the letters patent, filed by the said Pier Alberto Balestrini in the Great Seal Patent Office on the 6th March 1857.

To all to whom these presents shall come, I, Pier Alberto Balestrini, of Brescia (Italy), send greeting.

Whereas her most excellent majesty Queen Victoria, by her letters patent, bearing date the eleventh day of September, in the year of our Lord one thousand eight hundred and fifty-six, in the twentieth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Pier Alberto Balestrini, her special licence that I, the said Pier Alberto Balestrini, my executors, administrators, and assigns, or such others as I, the said Pier Alberto Balestrini, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel islands, and Isle of Man, an invention for "improvements in protecting and laying telegraphic wires," upon the condition (amongst others) that I, the said Pier Alberto Balestrini, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said invention,
160 and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said letters patent.

Now know ye, that I, the said Pier Alberto Balestrini, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:—

This invention has for its object a method of protecting telegraphic wires for submarine and other communication. The telegraphic wires are insulated by gutta percha or vulcanized India-rubber, or they are inclosed in cords of hemp or other fibre rendered waterproof by a mixture of India-rubber and pitch. The wires, thus protected, form the core of the telegraphic cable; they are either laid parallel to each other, or they are laid spirally on a core of fibre or of iron wire covered with fibre. Eight or other number of cords of hemp or other fibre waterproofed with the composition before mentioned, are then closely wound in a spiral direction round this core, and the cable so formed is consolidated by passing it between grooved rollers. If the cable is intended for use under a considerable depth of water, it is strengthened by coiling round it (in the opposite direction to the coils of the cords) iron wires in long open spirals, and over these wires the cable is wound round closely with galvanized iron wire, and by the action of the galvanized wire on the non-galvanized wire a calcareous deposit is produced round the cable after it has been immersed for some time, by which it is much protected. Sometimes, with a similar object, strips of zinc are laid longitudinally of the cable under the wire coating. In places where the cable is likely to come in contact

with rocks, it is protected by having steel wire wound round it. To facilitate the laying of the cable, a description of parachute is attached to it at intervals, which parachute is so arranged, that when the cable enters the water the parachute opens, and prevents the cable from being drawn violently through the water. To protect wires, to be used suspended from posts or otherwise, they are enclosed in cords of hemp or other fibre, waterproofed with the composition before mentioned, and afterwards painted with zinc white.

Having thus described the nature of my invention, I will proceed more fully to describe the same.

Description of the drawings.

(Here follows diagram marked p. 163.)

Figure 1 shows a side view and section of the core of a cable intended to be immersed at a slight depth, the covered wires forming the core being laid parallel to each other; but when the cable is intended to be immersed at a great depth, the covered wires are
161 wound spirally around a small cord or curved wire, as seen at figure 2, or around an iron wire covered with hemp or other fibre, as seen at figure 3. These cores are then surrounded with hemp or other fibre rendered waterproof, as seen at figure 4, where the core has twisted around it eight cords, each composed of four strands. The cable thus made is then passed between grooved rollers, so as to compress the cords around the core, and so as to prevent it from stretching when being laid down. The cords twisted around the core are rendered waterproof in the following manner:—Raw caoutchouc is melted in a pan heated by a well-regulated fire until it is of the consistency of thick oil, when more and more caoutchouc is added; a quantity of pitch equal in weight to the raw caoutchouc employed is then well mixed in. The cords may be saturated with this composition, either by placing them in the composition and subjecting it to pressure, or by passing the cord through a series of heated pipes filled with the composition, each pipe being terminated by a conical gutta percha tube, which scrapes off the excess of the composition. The cable thus made is then stretched and bound round closely with iron wire, strips of zinc being placed horizontally between the coating of wire and the cable, which gives rise to a chemical and electrical action, which keeps the outside coating from rust, and produces a calcareous deposit, by which it is much protected.

If the cable is to be immersed to a considerable depth, long open spirals of iron wire are placed between the cable and its covering of galvanized wire, as seen at figure 5, the spirals running in the opposite direction to the coils of the cord. The iron wire composing the spirals not being galvanized, the same action takes place between the galvanized and non-galvanized wire, which preserves the cable until the calcareous deposit is produced. In places where the cable is likely to come in contact with rocks, it is protected by having

steel wire wound round it. Figure 6 shows a side view of the parachute employed for facilitating the laying of the cable. Figure 7, a side view of the parachute when closed; and figure 8, a section of the same when open. These parachutes are formed by preference of double sail cloth, cemented together by caoutchouc, and formed into a cone, the top of which is firmly fixed to the cable, and at the bottom of the cone there are a number of ropes attached, which are also fixed to the cable. When the cable is coiled up, these ropes are doubled up in the parachutes, and the parachutes are folded around the cable; but when the cable is lowered into the water, these parachutes open, and by their resistance to the water, they prevent the cable from descending too rapidly. In certain cases when the parachutes would not be suitable, floats may be attached to the cable at short distances from each other, by means of a connecting apparatus filled with any substance soluable in water, and thus
162 capable of releasing the float a short time after that the cable enters the water.

To protect wires to be used suspended from posts, or for military or other purposes, they are enclosed in cords of hemp or other fibre, waterproofed with the composition, and in the manner above mentioned, and afterwards painted with zinc white.

In witness whereof, I the said Pier Alberto Balestrini, have hereunto set my hand and seal, this thirty-first day of December, in the year of our Lord one thousand eight hundred and fifty-seven.

PIER ALBERTO BALESTRINI. [L. S.]

Witness,
T. BASSET, 2 Rue Drouot.

London: Printed by George Edward Eyre and William Spottiswoode, printers to the Queen's most excellent majesty. 1857.

(Here follows diagram marked p. 164.)

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No. 165 October Term, 1891

Supreme Court of the United States

THE ANSONIA BRASS AND COPPER COMPANY,
Appellant,

VS.

THE ELECTRICAL SUPPLY COMPANY,
Appellee.

Brief for Appellant

CHARLES E. MITCHELL
JOSHUA PUSEY
Counsel for Appellant

(V 51)

Supreme Court of the United States.

THE ANSONIA BRASS AND COPPER COMPANY, *Appellant*, *vs.* THE ELECTRICAL SUPPLY COMPANY, *Appellee.*	No. 165, October Term, 1891.

Statement of the Case.

This is an appeal from the Circuit Court of the United States for the District of Connecticut, by The Ansonia Brass and Copper Company, the complainant below, against whom the said Court entered a final decree in equity dismissing its Bill of Complaint, with costs, which Bill charged the infringement by the said Electrical Supply Company of Letters Patent No. 272,660, granted February 20, 1883, to Alfred A. Cowles, for an improvement in insulated electric conductors.

The Bill, which was filed August 6, 1884, recited the grant of the Letters Patent and the assignment thereof to the complainant by an instrument of writing, bearing date the seventeenth day of April, A. D. 1883, and duly recorded on the twenty-first day of July, 1883, and charged the defendant with the infringement of the exclusive rights of the complainant under said Letters Patent and assignment, by the manufacture and sale of certain insulated electrical conductors according to and containing the invention described in said Letters Patent, and so identified in the proofs subsequently taken.

An answer was filed, which, whilst admitting the manufacture and sale of insulated electrical conductors according to the method or process of the said Letters Patent, averred that the defendant had the right so to do, for the reasons that the alleged invention was without patentable novelty or invention, in view of the prior art, and especially in view of certain prior Letters Patent, and that before the said invention of Cowles the same had been known to and publicly used by certain persons, said prior patents and the names and residences and the places where such knowledge or use was had being duly set out in the answer.

The complainant duly filed its replication to the answer, and proofs were taken by complainant and by defendant, and the cause having come on to be heard, the Circuit Court, on the third day of September, A. D. 1887, rendered its decision, dismissing the Bill of Complaint; whereupon, on the eleventh day of October, A. D. 1887, before a decree had been entered in the cause, the complainant filed petitions for a rehearing, upon the record and affidavits, the defendants filing counter affidavits; which petitions came on to be heard, and on the eighteenth day of May, A. D. 1888, the Court rendered its decision, denying the prayers of said petitions; and on the fourteenth day of July, A. D. 1888, a final decree was entered, dismissing the Bill of Complaint with costs, from which decree the complainant appealed.

The Nature of the Cowles Invention.

[The specification and drawings of the patent appear on pages 66 to 68 of the transcript of records.]

The invention is an improvement in insulated electric conductors and method of insulating the same; relating specifically to fire-proof conductors, as appears by the specification and claims of the patent, which latter are as follows:

1. *The method herein specified of insulating electric conductors and rendering the coating substantially non-combustible, consisting in applying a layer of fibrous material, a layer of paint, and a second layer of fibrous material upon the paint before it dries or sets, substantially as set forth.*

2. *An insulated and non-combustible covering for electric conductors, composed of two or more layers of cotton or similar threads, with paint that intervenes between the layers and fills the interstices of the covering, substantially as set forth.*

The inventor states, at the beginning of his specification, that with the braid-covered wires insulated with paraffine, asphalt, etc., in use prior to his invention, accidents occurred in consequence of the wire becoming overheated and setting fire to the insulation. For this reason objections were made by underwriters to insuring buildings against loss by fire where electric lamps were introduced and the paraffine-insulated wires were used. "To render the conductor fire-proof, without interfering with the insulation, led me to invent and manufacture the insulated electric conductors to which the present invention relates," says Mr. Cowles in his specification, page 67.

Thomas A. Edison, the well-known inventor and electrical expert, testifies on page 48 to 50 of the record as to his knowledge of, and experience with, the electric-lighting conductors in general use previous to the Cowles invention, and of the serious objection referred to in the patent of the latter; of his (Edison's) unsuccessful efforts to obviate or neutralize these dangers, which were not overcome until he used the Cowles wire.

The object of the Cowles invention, then, was to produce a practically fire-proof, and, at the same time, electrically insulated conductor wire, such as was to be used for electric-lighting, and such as was, in fact, put upon the market for that purpose by both the complainant and the defendant.

It may be here remarked that, necessarily, in such case, the danger of fire arose from within, so to say, that is, from the intense heat of the copper wire setting fire to the insulation, and thus to the woodwork or other inflammable material adjacent. If the danger arose merely from the ordinary external heat setting fire to the insulation, it might be an easy matter to overcome that; but how to confine this fiery steed within, seeking every avenue of escape, required the solution of a problem, and it required the experiments and invention of one familiar with the art. This problem Mr. Cowles solved by devising a method of covering and loading the conductor wire with a material, to wit, ordinary paint, in such manner that, whilst the wire always remained as well or better insulated electrically than before, its covering was made practically non-combustible; and this without interfering with the efficiency of the conductor under the ordinary conditions to which it would be subjected, such as to bending and twisting, and sometimes to considerable external heat, etc.

In carrying out his invention Mr. Cowles called to his aid the apparatus shown in his patent, consisting, essentially, of two ordinary braiders, one above the other, and a conical vessel intervening between the braider-heads. The wire, naked (or covered with paint if desired), is passed through the head of the lower braider, which applies the first layer of thread as a continuous operation. The once covered wire then passes on up through the vessel containing the paint, preferably white lead or white zinc ground in oil, and mixed with a suitable dryer.

A large body of paint is carried up on the braid-covered wire, it being, so to say, lodged thereon, until, upon the second braiding being applied as the wire advances, the paint is forced not only into the interstices of the first covering down to the wire, but also into and out between those of the second covering; and thus both the fibrous coverings are coated with the paint, and the interstices are charged, or, as it were, surcharged there-

with. The oil mixed with the paint, which oil is not fire proof, is, of course, largely absorbed by capillary attraction, but it is occluded by the incombustible solid portion of the paint.

The specification says (middle of page 67):

"In practical use it is found that the covering is of the most reliable character, it is compact and hard, the wire is perfectly insulated, and there is no possibility of inflaming the covering. With intense heat the threads may char, but they will not burn."

It will be observed that, in order to carry out the invention, and to produce the results aimed at, the specification provides that the paint should be preferably fresh, although it may be dried, or, rather, partially so, before the second layer or thread is applied, but it is quite clear, from the descriptive part of the specification, that it is essential that the paint shall not be allowed to set or harden before the second layer is put on.

The claims also embody the same limitation—the first claim, providing that the second layer of fibrous material is to be applied upon the paint before it dries or sets, and the second claim, requiring that the paint shall not merely intervene between the layers of threads, but also fill the interstices of the covering makes in effect a similar limitation.

The drawings annexed to the specification show clearly the apparatus by which the process is usually conducted, the wire (*a*) ascending through the first braiding head, which puts on the first layer of thread, then continues on through the packing (*d*) and enters the vessel (*c*) containing the liquid paint, which saturates the covering—the surplus that is not arrested, so to say, by the irregular or indented surface of the fabric, rolling down into the said vessel. The wire thus carrying a large and uniform body of paint, now passes on to the second braiding head, which applies, under considerable stress, the second covering of thread. The body of paint, partly entangled in

the depressions between the threads of the first covering, is caught in the embrace of the threads of the second braider, and, to quote from the specification, p. 67, "*The threads that are braided upon the paint force the paint into the first braided covering and at the same time the paint oozes through between the threads. Hence the paint is incorporated throughout the braided covering and fills up the pores.*"

It is this *crowding* of the paint into the coats of braiding that enables the inventor to load the conductor with the greatest possible body of paint, and to make the covering "compact and hard" and of the "most reliable character," the wire being "perfectly insulated," whilst "there is no possibility of inflaming the covering," so that "with intense heat the threads may char, but they will not burn."

Now, it will appear that whilst paint is essential, it is equally essential that it shall, *first*, intervene between the layers of thread, and, *secondly*, "fill the interstices of the covering," so that, as the specification aptly says, "The paint is incorporated throughout the braided covering and fills up the pores," thus producing what Mr. Edison (ans. to Q. 10, page 49) well terms a "*paint-permeated*" wire.

It is well to quote here from Mr. Cowles' testimony, answer 20, page 61 of the Record, wherein he gives from a practical standpoint a clear statement of the nature of his invention, as compared with an electric-light conductor which he had been making for the Brush Electric-Light Company, consisting of double-wound wire heavily coated upon the exterior with paint.

"20 *Q*. Please explain from a practical standpoint how you succeeded in getting more paint on the wire by your new process than when the wire was first double-wound and then painted as the wire was made which you had been furnishing the Brush Company?

A. When the wire is double-wound and then painted and a heavy coating of paint adheres to the fibrous material, after the wire has left the bath of paint, the paint

will run upon the wire so as to be thicker in some places than in others. The requirements for perfect insulation of wire are such that an uneven coating is a great defect in the insulation. Furthermore, in the process of taking the wire from the bath of paint and drying the same, the paint being in a soft condition, a portion of it will be removed from the surface at various points in handling and drying.

Furthermore, the paint does not by this process penetrate and become incorporated with the fibrous material, but remains on the outside, while the oil with which the paint is mixed soaks into the fibrous material.

The wire is thus covered with a coating of fibrous material soaked in oil, which is highly inflammable, while the oxides or carbonates constituting the non-inflammable portions of the paint remain upon the outside in a coating of varying thickness, and in a condition in which they are liable to flake or peel off the wire by abrasion or bending.

These difficulties are overcome by my process in the following manner: When the wire with its first covering of braided cotton passes through the vessel containing paint, the second braiding of fibrous material being applied upon the paint while the paint is still wet, the paint is distributed evenly by the action of the second braiding upon the surface of the first covering, and by the mechanical action of the second braiding, the oxides or carbonates consistuting the non-inflammable portion of the paint are forced into the interstices of the first covering, and at the same time the paint oozes through the threads forming the second covering, thereby coating the wire with a solid, uniform covering of non combustible material which acts also as an insulation, and which is held in its place by the threads of the textile material.

The gist of this invention may be said to lie in or result from the discovery that inflammable paint could be used in

combination with inflammable thread, in connection with wire, in such a way as to produce the practical effect of non-combustibility under the intense heat of the electric current, yet maintaining the other requirements of such conductors, such as flexibility and good insulation; and this result the inventor attained by a mode of application and manipulation which charged, loaded, saturated, or permeated the jacket or covering with paint, which occludes the combustible constituents in such a manner that they cannot inflame with the intense internal heat to which they are subjected, whereby a practical result was produced that had not been previously attained and a new and highly useful manufacture, to wit, a high tension, fire-proof electrical conductor.

The History of the Cowles Invention.

It may be here observed that this invention was made by a man who was eminently a practical one in the line of electrical conductors, he being an active officer of the appellant, the Ansonia Brass and Copper Company, a large manufacturer of conductors; and it may be further observed that, although he was well aware of what was required in a conductor for electric-lighting purposes, it was not until after much thought and experiment that he discovered how to produce a perfectly non-combustible insulation; and not then until he had abandoned the first line of experiment, and, so to say, struck out a new lead. Mr. Cowles' testimony appears on pages 58, etc.

When Mr. Cowles began his experiments it appears that the wire for electric-lighting in general use was double wound with thread saturated with paraffine, applied hot, and thus in liquid form. (See Fowler's testimony, page 19; also Edison's, page 48, and Cowles', page 61.)

A specimen of this wire is in evidence, marked "Complainant's Exhibit, Paraffine Wire."

A serious objection to this paraffined wire was that accidents were liable to occur, and, in fact, did occur, from the covering becoming inflamed from the heat of the powerful currents of electricity passing through the wires, and thereby setting fire to buildings.

Mr. Edison states (ans. 5, page 48) that it is essential that electric-lighting wires for inside use should not have their insulating coating inflamed, "as it frightens the consumer," and "is not permitted by the fire insurance company." And again he says (ans. 8, page 48), speaking from practical experience, when the wires became crossed "the paraffine would become inflamed, melt, and drop on the floor, while still burning."

In answers 9 and 10, Mr. Edison (page 49) relates his early experience with such wires, and describes how he employed devices termed "safety catches," which he thought would render it safe to use said paraffined-coated wire; but finding that these safety appliances were not to be relied upon, and being ordered by the Board of Fire Underwriters, in New York, to take all the paraffined wire out, he substituted therefor the only uninflammable conductor which he then knew of, or knew of when he gave his testimony (ans. 13, page 49), to wit, the Cowles wire, which "worked satisfactorily;" and he, Edison, has continued to use in very large quantites. (Ans. 12.)

Mr. Cowles, in the latter part of the year 1880, at which time his company was making the paraffined wire, and also a paint-covered wire for the Brush Electric Company, of Cleveland, Ohio, was requested in a letter from the Brush Company dated December 9, 1860, "Complainant's Exhibit, Brush Letter," page 68, addressed to the Ansonia Brass and Copper Company, to furnish ten thousand feet of double insulated copper wire, which, they say, "We would like to have *more heavily coated* with paint than what you have sent us, as otherwise it does not answer for insulation when the wire is wet."

The wire that had been previously sent was a copper wire covered, first, with a double winding of cotton, then painted on the outside of the covering. A sample, "Complainant's Exhibit Cowles Brush Illustration," is in evidence, made in exactly the same manner as that sent to the Brush Company prior to the letter of December 9, 1880.

Upon receipt of this letter, Mr. Cowles "began to experiment and to devise various methods of insulating wire by the use of paint and fibrous material."

In answer to Q. 9, page 59, he says:

"The defect mentioned in the Brush Letter I found to be very difficult to overcome. In filling their order, I could devise no better means than to put on a very heavy coating of paint outside cotton covering; this I did by causing the paint to be made very thick, but I found when the paint was applied in this manner the coating of paint was not uniform or even, and, furthermore, when the wire was bent at a sharp angle, or subjected to abrasion, the paint was liable to crack or flake and peel off, thus rendering the insulation defective. In the latter part of December, while at our factory at Ansonia, I took several pieces of wire which were covered with fibrous material, wound upon the wire. These pieces I dipped in paint, and then, while the paint was fresh upon the fibrous coating. I applied another coating of fibrous material in the form of thread by winding it upon the paint. This, I observed, kept the coating of paint upon the wire, distributed it evenly, and at the same time, by the act of winding the thread upon the paint, the paint was forced into the interstices of both the coverings of thread, thereby securing a better insulation than I had before made."

The complainant first took orders for the new wire in quantity, and began manufacturing the same in the month of May, 1881, and has manufactured the same continuously to the extent of more than two millions of pounds, or, say, 10,000 miles.

In May 17th, as appears by the complainant's Exhibit Cowles-Edison Letter, May 17, 1881, page 69, Mr. Edison wrote in reply to an inquiry in Mr. Cowles' letter of that date that he would, he thought, be able to take five tons per week of the wire.

The Value and Utility of the Cowles Invention.

The defendant does not undertake to gainsay the value and utility of the invention, and it is submitted that few cases furnish such evidence of surpassing utility, and this fact, it is urged should have its due weight in disposing of any debatable question of invention.

We quote the uncontradicted testimony on this point of the complainant's witnesses, Thomas A. Fowler, Thomas A. Edison, Frank G. Stone, and Alfred A. Cowles.

Mr. Fowler (answer to *Q.* 9, page 19) says:

"The sale of the Cowles conductor almost entirely superseded the sale of the paraffine conductor for electric lighting purposes."

Mr. Stone says (answer to *Q.* 17, page 57):

"We had a large stock of the paraffine wire on hand in our New York warehouse, and we tried ineffectually to dispose of it. Being unsuccessfull in disposing of the wire, we returned it to the factory to have the insulation burned off, so as to save the copper wire."

Mr. Cowles, previously stating that his company had sold more than two millions of pounds or 10,000 miles of his improved conductor, says, in answer to *Q.* 19, page 61:

"The effect of the introduction of the wire invented by me was to immediately supersede the paraffine wire generally used for electric lighting purposes, and so quickly to take the place of the paraffine wire that we could not dispose of the paraffine wire which we had in stock for electric lighting at the time I made my improve-

ment. The electric lighting companies would not buy it, and we had to send it to our factory and burn off the insulation to make the wire available for other purposes."

Mr. Edison, who is truly an expert, and well known to be such, testifies strongly as to the superior utility of the Cowles conductor (which he has used in large quantity), as well as its novelty, and as to its being "a real and important improvement" for electric-lighting purposes, requiring "the use of the inventive faculty to produce the same." (*Qs.* 18 and 19, page 50.)

The Relation of the Cowles Invention to the Prior State of the Art.

In discussing the subject-matter under this heading we will examine, *first*, the several (British) patents put in evidence by the defendant and referred to in the testimony of defendant's expert, Mr. John E. Earle, and in that of the complainant's expert (who, as solicitor, procured the Cowles patent, Mr. L. W. Serrell; and, *secondly*, the testimony of the defendant's witnesses, Bryant Rae, Reed, Hood, Holmes and Williams, as to certain manufactures of conducting wires anterior to the Cowles invention.

As none of these patents, and none of the witnesses (except Bryant and Rae, whose testimony will be considered further on), described the identical invention of the Cowles patent, it is presumed that they were introduced to show the prior state of the art. In fact, this seems to be all that is claimed for them.

It may be remarked that the numerous patents put in evidence by the defendant would show that there have been many attempts to secure a suitable and sufficient insulation of cables and wires, without reference to fire-proof qualities. Cowles secured not only the electric insulator, but the fire proof quality, both from within and without, which it does not appear was ever before attained.

Prior (British) Patents: (See Addition to the Record.)

Although it may be said that the methods and products described in the several patents hereinafter referred to, and also those mentioned by some of the defendant's witnesses, relate to the covering and insulation of cables, wires or conductors, and that these have a general relation to all conductors of electricity, yet Mr. Cowles' improvement may be said to relate rather to a somewhat different art, to wit: the manufacture of *electric-lighting* conductors, wherein the conditions, requirements and difficulties in the way of attaining practically successful results, are quite different from those incident to the mere electrical insulation of the ordinary conductors.

The defendant would hardly contend that any of the conductors insulated as described in any of the said patents (or as described by the witnesses) could be used to take the place of the Cowles wire for electric-lighting.

It is this specific improvement of Mr. Cowles in this special art of making electric-lighting conductors that has made the way to the success—at least the commercial or practical success—of the new light.

As the numerous patents mentioned in the defendant's answer would seem to attest, it was no easy matter to secure a cheap and efficient electrical insulation for ordinary conductors: As hereinbefore stated, Mr. Cowles secured not only the insulation of powerful currents, but, as before stated, the fire-proof protection as well, both from within and without; at the same time he secured or retained all other *desiderata* or requirements of an electric light conductor.

To accomplish these combined results was a far more difficult task, and commendable thing to do, than the simple insulation of a wire designed to carry comparatively weak currents of electricity.

As we do not think that these patents relate to the same, but only a cognate art, as the Cowles invention, we proceed to refer more particularly to these patents under protest, as it were.

Brown and Willams Patent, No. 12, 991, of 1850. (Page 2 of Addition to Record.)

This patent describes the manufacture of telegraphic wire by covering the same with two or more layers of fibrous material, in connection with gutta-percha, pitch, or similar mater, as the insulating substance, the gutta-percha, etc., being liquified by heat and soaking into the several coatings.

To this it may be added that it is obvious, that as the covered wire passes through the contracted orifice at the lower end of the conical vessel containing melted gutta-percha, or pitch (shown in Figure 18 between pages 2 and 3, of the Addition to Record) the fluid must be scraped off from the thread covering.

John Wallace Duncan Patent, No. 906, of 1853
(Page 11 of Addition to Record.)

This patent describes the insulating of wire by means of cements of gutta-percha, etc., applied to the wire and covered by strips of ribbon. The wire thus covered is again run through the gutta-percha, etc., and this is covered with a ribbon of sheet metal, textile, or other suitable fabrics.

Even if paint were substituted for the gutta-percha, etc., in this process, the paint would not penetrate the *strip* of metal or other ribbon in the manner of the Cowles process, but would simply be applied, as it were, on the surface of the ribbon of metal or other suitable fabrics of

proper width, instead of being bound in by the threads of the Cowles process. There is no suggestion in this patent of fire-proofing, or of a method that could possibly result in a fire-proof conducton.

Felix Marie Baudouin Patent, No. 933, of 1857:
(Page 19 of Addition.)

This patent describes the covering of electric wires or conductors by means of a succession of ribbons of *paper*, or other suitable material, which ribbons are passed through a bath of *hot bitumen*, and "the coated and lapped wire is passed through suitable dies to remove superfluous matter to smooth down the lappings of the ribbons and to compress and cause the proper adhesion."

This patent mentions india-rubber, resin, gum-lac fatty oils, etc., in addition to bitumen. The main object, of this construction appears to be to form a protective coating, or an *armor*, for the gutta-percha insulation with which the wire was coated. No function is discharged by any of the ribbons, which ribbons of paper would not perform, and the only use of thread mentioned is as a substitute for an outside "dry tape or ribbon."

William H. Horstman Patent, No. 434, of 1859:
(Page 32 of Addition.)

Horstman runs the wire through a machine for brightening the same, and then gives it one or more coatings of gum-lac. The wire thus coated is covered with cloth or other fibrous material. The patentee states that the wire runs through an apparatus filled with resin mixed with sufficient tar to make it pliable, or with a similar compound of resinous gums. This is preceded by a coating of muslin, tape, paper or other fibrous material or gutta-percha or india-rubber.

He also refers to a kettle or reservoir in which the gum-lac, pitch or resin composition is heated by steam. The materials used are all of a highly inflammable nature, and are liquified by heat, so that they will be absorbed by the fibrous material.

Charles William Siemens Patent, No. 464, of 1863: (Page 38 of Addition.)

This patent is merely for covering a wire with the juice or milk extracted from the india-rubber or gutta-percha tree in its native state, in place of gutta-percha and india-rubber artificially dissolved.

The patent speaks of running the covered core through a bath of the rubber or gutta-percha juice; then, before the latter has become consolidated or dry, it is covered with a second layer of hemp or other fibrous material in the reverse direction. The result of this process would be that the fibrous coverings would absorb the homogeneous liquid juice, which would saturate the fibre, but that a body of the gutta-percha or india-rubber would remain upon the surface of the first covering, and fill up the interstices between the threads of hemp by the stress of the second covering (as occurs with the paint in the Cowles process), does not appear. In fact, it is altogether improbable that such would be the case.

Siemens' object was apparently two-fold: *first*, to saturate the fibrous covering, and, *secondly*, to cause some adhesion between the threads of the two layers from the juice that would be squeezed out by the second layer; or it may be surmised that the patentee thought that, perhaps, if the first layer were disturbed by the second before the juice had become consolidated and dried the threads would be forced apart by the second coating, and the continuity of the insulation be permanently broken. This patent clearly does not disclose or suggest the Cowles invention.

There should be kept in mind the distinction between a homogeneous liquid (like gutta-percha juice, hot bitumen and similar substances), and paint, which is a solid suspended in a liquid, and which liquid is largely absorbed by the fibrous covering, and the incombustible solid is forced into the interstices between the threads of both coverings.

William Thomas Henley's Patent, No. 1126: of 1864; (page 46, of Addition).

The wire is taken through the composition, kept fluid by means of a steam-chest. (The compositions mentioned in the patent are resinous matters, a mixture of linseed oil and resin, gutta-percha and beeswax, and bitumen.)

It is then coated with dry cotton or other suitable fibrous material from the bobbins, descends to the steam-chest, and receives another application of the composition. On leaving the steam-chest it passes through a conical die, which *takes all off the superfluous material.* This covering may be repeated as often as necessary.

Jaloureau and Lardy's Patent for telegraphic cables, No. 2942, of 1867: (page 53 of Addition.)

This patent does not differ essentially, so far as its bearing on the present case is concerned, from the preceding patent, and some others referred to in the testimony. Jaloureau and Lardy apply hot bitumen as a bath to paper or other material wound upon the wire in successive layers.

Joseph Rodgers' Patent, No. 3314, of 1870: (page 59 of Addition.)

The wire or strand of wires, surrounded by bobbins of yarn or thread, is drawn with the threads through a trough constructed in divisions, the first of which contains heated air, the second forming a cauldron of insulating material (such as india-rubber or gutta-percha), and the others being constructed to repeat the process as often as described. The patentee says that the passage of the wires through the hot-air chamber serves to remove all moisture from the surface of the wire; and it also desiccates the fibres, thus rendering both capable of taking up the insulating compound. No provision is made for confining a large body of fire-proof material in the interstices or between the fibres, but after the conductor has been otherwise completed, it is drawn out through a die which removes superfluous material, and chalk silicate or earthly dust is applied to the surface.

George Frederick James' Patent, No. 1333, of 1880: (page 62 of Addition.)

This patent describes the covering of a wire by layers of fibrous fabric, in connection with an insulating material (not mentioned) and a heating device. The first layer of fabric is applied longitudinally, and the second by winding. As stated by Mr. Serrell, there is no reference in said patent to a method of encasing and confining metallic oxides and carbonates to render the covering fire-proof.

Charles West's Patent, No. 2321, of 1858: (page 65 of Addition.)

This patent describes a mode of covering wires with india-rubber in lieu of gutta-percha, which the patentee had previously used.

The specification mentions the use of paint, although on this point, it is somewhat obscure. He states that for the purpose of preserving one or more wires or conductors when placed in the interior of a rope or cable, he used a covering of hemp or fibrous material saturated with a composition consisting of one or more of the metallic carbonates or oxides mixed with some of the finer oils. Just how the fibrous material is saturated with the paint does not appear.

It appears from the third claim of the patent that this paint-saturated fibre is used for the purpose of preserving wires already insulated with the india-rubber, etc., said claim being as follows: "The covering of insulated wires or conductors with yarns of fibrous material saturated with a composition, as hereinbefore described, for the purpose of preserving such fibrous material, and causing it more effectually to protect the insulated wires or or conductors from injury."

Chatterton & Smith Patent, No. 2066, of 1860: (page 71 of Addition).

The provisional specification is quite brief and general in its terms, and is substantially the same, so far as it goes, as the next following patent. It does not disclose the complainant's invention.

Chatterton & Smith Patent, No. 175, of 1861: (page 72 of Addition.)

This patent is for improvements in the manufacture of telegraphic cables, and describes an improved method wherein gutta-percha, hot pitch, etc., are used in connection with fibrous materials in covering gutta-percha insulated wires. The patentees say that "the iron or

steel wires that are used to give strength to the electric telegraph cables" may be covered with fibrous material saturated or covered with paint. This part of the description does not relate to the conductor, but to an armor that is applied outside the gutta-percha insulated conductor to adapt the cable for submarine use.

As Mr. Serrell, complainant's expert, (page 27 of Record) says: "From this description no person would be able to make the wire covered by complainant's patent, and the conductor itself would not be rendered substantially fire-proof as required by complainant's patent, because the gutta-percha forming the covering of the conductor itself is highly inflammable, and would be burned up if the conductor became highly heated by the electric action."

Alfred Foucaut Patent, No. 2008, of 1869: (page 76 of Addition.)

This patent describes the covering of each conductor with gutta-percha, which is afterwards wrapped with thread. It also mentions the use of ceruse, or carbonate of lead finely powdered and mixed with litharge, oil and sawdust applied to the wires in lieu of the gutta-percha. The wire thus coated and wrapped with thread is covered with a metallic conducting coating, preferably plumbago or tin, or other metal foil, or a small wire wrapped around the gutta-percha or composition.

No one could from this patent obtain information that would enable him to make a fire-proof wire according to Cowles' patent.

Henry Highton's Patent, No. 2547, of 1872, improvements in submarine cables, etc. (page 80 of addition).

The conductor is first covered with gutta-percha, and a coating of boiled linseed oil mixed with red lead is

applied upon the gutta-percha. Nothing is said about a fibrous covering of any kind. The object of the composition referred to appears to be to fill up any minute pores in the gutta-percha.

Alexander Wilkinson's Patent, No. 3083, of 1873, improvements in coating and preserving telegraph wires, ropes and cables (page 82 of addition).

This patent describes the use of a solution of white lead, boiled or raw linseed oil, tallow and naphtha (not a fire-proof composition) and which is applied to the outside of one covering. Mr. Serrell page 28 of Record) says: "And the same patent also provides for forming a cable of a series of wires coated with strips soaked in white lead, pitch and oil, and a final exterior coating to the cable is spoken of for rendering the same both fire and water-proof, but this coat is simply a paint upon the outside, which of course does not take away the combustible character of the inner coverings containing pitch, tallow and similar material; and it will be borne in mind that electric telegraph cables submerged never become heated in consequence of the electric action, and the cable made according to this patent is not adapted to electric lighting purposes, because it would be destroyed by the wire itself becoming heated."

Thomas Walker Patent, No. 274, of 1870: (page 87 of Addition).

Walker says that he covers electrical conductors with gutta percha or india-rubber dissolved in naptha, or other volatile solvent, either pure or mixed with gums, resins, pitch, bitumen, etc., or any other water-resisting substance, and lampblack, powdered glass or fine sand, either in combination or singly; and also uses any kind of oil, varnish or paint mixed with any pigment, or the above-

mentioned substances alone, or combined with the gutta-percha or india-rubber. He then proceeds to state that he uses the conductors covered with any suitable fibrous materials (in what form or how is not set forth) such as cotton, jute manilla, hemp or cocoanut fibre, or similar substances without such covering.

Pier Alberto Balestrini. Patent, No. 2124, of 1856 : (page 89 of Addition).

This patentee insulates the wires by gutta-percha or vulcanized india-rubber, or they are enclosed in cords of hemp or other fibre rendered water-proof by a mixture of india- rubber and pitch. He further says that to protect wire to be suspended from posts, they are enclosed in cords of hemp or other fibre, water-proofed with the gutta-percha and pitch and afterwards painted with zinc-white.

Now, a critical examination of the several patents hereinbefore referred to, and of the exhibits put in evidence by complainant, of conductors made according to the modes described in the respective patents shows, it would seem obviously, that no one of said conductors embodies therein the Cowles invention; and that none could be substituted for the Cowles conductor for electric-lighting purposes. As Mr. Serrell aptly says, ans. to Q. 185, page 32, of Record, "Among all these prior patents and exhibits, there is not one that is adapted to electric-lighting purposes as the same exists to-day."

The use of paint, it is true, has been suggested, but not for the purpose of insulation especially, but as an armor or a protective or preservative covering for a conductor which has already been coated with a suitable insulating material.

The Cowles patent does not pretend to claim, broadly, the use of paint in connection with a fibrous material as a covering for conductors; paint is essential, but it involves the use and manipulation of the paint and the fibre in a certain definite way, whereby there is produced an improved article of manufacture fulfilling all the requirements of an electric-light conductor, which, it does not appear, could be produced by the use of paint in the modes described in any of the patents set up in the defendant's answer, or, so far as known, in any other way.

The defendant's expert, Mr. Earle, in laying the foundation upon which he builds the superstructure made up of the British patents referred to in his testimony, ignores as essential the very cornerstone of the Cowles invention to wit, paint which is caused to "intervene between the layers and fills the interstices of the covering." He substitutes, therefor, an *omnium gatherum*, which he terms an "insulating material," and proceeds to argue that the Cowles invention is but the mere substitution of paint for the other materials mentioned in said patents, with results that would have been obvious. This suggests the pertinent inquiry why is it, if this be so, that so important and valuable a result was not obvious to manufacturers of electric-light conductors and others familiar with the art and the requirements of a perfect conductor, such, for example, as "the wizard of invention," Mr. Edison? It was obvious enough after Mr. Cowles had made known his discovery.

Mr. Serrell, the complainant's expert, on page 36, C. R., explains clearly the difference between the use of asphaltum and other bituminous (inflammable) materials

mentioned in these British patents, as insulators, and the use of paint as employed by Mr. Cowles.

Mr. Serrell says, answer to *Q.* 16, page 30, of Record:

"Asphaltum and bituminous materials are all inflammable, and if introduced in place of paint in the covering of an electric conductor would render that covering inflammable, instead of fire-proof. In the mode of operation or process involved in covering the electric conductors, the action of asphalt or bituminous material in the heated or dissolved condition in which it has to be used is very different from that of paint.

The bituminous material being substantially homogeneous, penetrates the fibrous covering almost instantly and with uniformity, especially as the high heat of the melted bitumen expels the air from the fibrous materials, and the bitumen fills such pores or interstices.

With paint the operations are radically different, the solid or earthy materials, such as metallic oxides or carbonates, do not by any affinity flow into the pores or interstices, but require to be forced into the same by the mechanical power exerted in winding or braiding the thread; the oil alone, which is one of the constituents of the paint, passing into the fibrous material by capillary action, and when paint is made use of there is nothing to expel the air from the pores of the thread except the mechanical pressure of the thread upon the paint.

Mr. Earle, having first endeavored to show that paint was but the equivalent of the other insulating materials, states, in answer to Int. 12, page 97 of Record, the reasons for his opinion that the Cowles patent does not disclose a patentable invention in view of the prior art: That

"The Cowles patent in suit describes the fibrous coverings as layers applied successively, without limitation as to method of applying such fibrous material, and it mentions '*paint*' as the insulating material, the paint

being 'preferably white lead or white zinc,' and the process or method describes three steps:

"*First.*—Applying a layer of fibrous material.

"*Second.*—A layer of paint, and

"*Third.*—A layer of fibrous material upon the paint before it dries."

In answer to the foregoing, Mr. Serrell (ans. to Int. 17, page 31 of Record), in addition to what he elsewhere says, remarks:

"I do not agree with Mr. Earle, because the statement of his first and third points of the process do not correspond with the first and third steps of the process in the Cowles patent.

He does not distinguish between a layer of fibrous material, such as a strip of woven cloth, and a winding or braiding of threads, such as in the Cowles patent.

Where a layer of fibrous material is made use of, such as a woven strip, it is impossible to incorporate the paint throughout the covering in such a way as to fill the pores, and I do understand that the Cowles patent is limited as to the method of applying fibrous material. I do not understand that the said patent applies to a tape or woven strip, which, of course, when put upon the wire, would make a fibrous layer."

We conclude the references to these patents with the following quotation from the opinion of the learned Judge of the Circuit Court, folio 257, page 136 of the Record.

"*The English Patents, a large number of which were introduced, are not an anticipation; they are all simply for electrical insulation and are expedients to guard against the dangers from water and not from fire.*

"Where any of them use paint, such use is in connection with inflammable materials and is simply as a protection for the water-proof covering.

"Neither was it shown that before the date of the invention, which was in the spring of 1881, paint had been knowingly used, except experimentally, to make a non-combustible insulation. The defence based upon the English patents and upon the known use of paint as a non-combustible material for covering electric wires must fail."

PRIOR USE.

Thomas W. Bryant (page 99 of Record), Superintendent of the Electric Supply Company, testifies that in the year 1881 the said company (whose factory is only about 200 yards from that of the complainant) made electric conductors in substantially the same manner as that described in the Cowles patent. Previous to that time the said company made the ordinary paraffined wire.

As the time fixed by Bryant was long subsequent to the Cowles invention, further comment on Bryant's testimony is unnecessary.

Alexander Rae (page 106 of Record), who worked under Bryant's instruction, testifies to the same general facts as those referred to in the latter's testimony, and shows nothing to anticipate Cowles' invention.

Thomas L. Reed (pages 110 and 123 of Record), testifies to the manufacture at the Rhode Island braiding works of wires insulated with various materials; also as to some experiments in making a wire in Dyer Street, Providence; stating in answer to Int. 7, page 111, "We used paint there to a small extent when we first com-

menced experimenting—white paint and green paint." How the paint was used there does not appear.

Mr. Reed further describes a method used by him whilst in the Rhode Island Braiding Company's building for insulating annunciator wires. The wire was passed into a tub containing paint, and thence up to a braider which put on the fibrous covering, and it was then wound upon a reel. The coil of wire was then thrown into a tub containing paint, then through a pair of clamp jaws onto another roll to dry. The object of the clamp jaws "was to *scrape off the surplus paint and compress it.*" [It is the "surplus" that Cowles wishes to hold and force into the interstices of the braiding].

This was certainly not the Cowles invention. Reed never used double braiders or winders.

Reed also made some experimental wire for Mr. Holmes (one of the witnesses for defendant), of burglar-alarm fame. Mr. Holmes wanted a wire charged with materials to prevent rats and mice from eating the cotton, and so Mr. Reed used green paint, charged with aloes and arsenic. He further states that his orders were to make a fire-proof wire, that is, fire proof from the outside. He speaks about using silicate of soda for filling the braiding, and obviously did not know any way of applying paint alone to make a fire-proof coating,—as he states he tried the experiment of using lime mixed with the paint. Reed did not know whether such wire had ever been put to any use.

Reed's testimony is somewhat confused, and although he mentions certain uses of paint, it is no way like the Cowles invention, or such as would suggest the same.

Arnold S. Hood (page 114 of Record) testifies, in a general way, to the same facts as those stated by Reed, and his testimony requires no special comment.

Edwin Holmes (page 116 of Record), the manufacturer of the Holmes Burglar Alarms, states that he used in his business, wire insulated by winding a thread around it, which thread was covered with paint, and that all of his wire was insulated in that way, *until paraffine was substituted for the paint.*

Although he states in answer to Int. 5, page 117 of Record, that some of his wire is in use in his burglar alarm business to-day, he did not produce a sample of the same.

In answer to Int. 3, "How was the paint applied?" he says: "I think at first it was applied with a brush; I applied it by drawing it through a vessel containing paint, and then through a piece of thick rubber or gutta-percha, *which removed the surplus paint*, and left a smooth surface on the thread which covered the wire."

Mr. Holmes also states (ans. to Int. 6, page 117), that he purchased such wire from Charles Williams, of Boston, and also of E. F. Phillips, of Providence, R. I., about 1872. Mr. Phillips, as stated in Reed's testimony *ante*, was a partner of Reed in the manufacture of wire. Holmes stated that he purchased the painted wire from Mr. Phillips, until he (Philips) substituted therefor the paraffined wire.

In answer to the suggestive question 9 (pp. 117 and 118), of defendant's counsel, whether it ever became necessary in his (Holmes') business to secure as perfect insulation of wire as possible (it being suggested that the answer be confined to the use of fibrous material and paint), Holmes states that he did it sometimes, previous to 1860, by covering the wire with a thicker thread, and two coats or more of paint; sometimes by a thread covering and a coat of paint, then another thread covering and a coat of paint on that. Following a very leading question (objected to by complainant's counsel as being leading and suggestive), the witness stated the first coat of paint was partially dried, so as to keep its place, but would admit of an

impression from the next covering of thread. He does not explain just how this process was carried on. It does not appear that the threads were applied whilst the paint was unset, or *so that it could be forced into the interstices of the threads.* The mere fact that the paint would admit of an impression from the next covering of threads shows nothing, as it is a well-known fact that paint will admit of some indentation after it has been dried for some days, or even weeks.

In any event, Holmes thought little of the paint covering, as he abandoned it for the paraffined wire. (Anwer to Int. 2, and Ints. 7 and 8, page 117.)

Charles Williams (page 118 of Record) testifies to the manufacture of certain wire for the Holmes Burglar Alarm Co,, of New York, and others, which he describes as follows in answer to Int. 5, page 119:

"The wire was first covered with cotton and afterwards run through glue; the glue was put in a funnel with a cork in the end of it, and the wire passed through a hole in the cork, and was wound onto the reel. As the wire was wound onto the reel it was passed through a cloth to take up the surplus glue, and make the wire smooth. It was afterwards painted by hand with a brush."

He states further, in answer to Int. 6, p. 119, that he used for painting the wire ordinary green paint with varnish, and in some cases white paint composed of white lead, spirits and varnish. This does not disclose or suggest the Cowles invention.

It is urged that none of these witnesses show the Cowles invention, but that they show no more than that paint has been employed in connection with conductors, in certain ways and for certain purposes, but none of them

for the purpose and in the manner, nor with the results of the Cowles invention. None of the wires described by any of the witnesses could take the place of the Cowles conductor.

Assignment of Errors.

1. The Court below erred in holding that the complainant's patent was invalid for want of patentable novelty.

2. The Court below erred in holding that the complainant's patent was invalid for want of patentable invention.

3. The Court below erred in dismissing the bill of complaint in view of the novelty and utility of the invention described and claimed in the patent, and the admission by the defendant of infringement of the patent.

Although it does not perhaps strictly follow, yet, we think it may be fairly inferred, from the language of the opinion of the learned Judge below, that the testimony that turned the scale against the complainant, was that of Edwin Holmes; for the opinion, after holding that the English patents were not an anticipation of the Cowles invention, and that the defence based upon these patents and upon the known use of paint as a non-combustible material for covering electric wires, must fail, proceeds to say (folio 258, page 136 of Record):

"The most important testimony which was offered by the defendant was that of Edwin Holmes."

We have hereinbefore reviewed the testimony of this witness, but we deem it proper to point out specifically the error that the Court apparently fell into in the interpretation and scope of Holmes' testimony.

In the first place the wire that Holmes made was but a slender wire for electrical burglar alarm purposes, and the only object he had in view in covering the same with

paint, or paraffine, was to secure insulation of the low-tension current that would be conducted by the wire when the alarm should be sprung.

As first the paint was applied with a brush, but subsequently by drawing the thread-covered wire from a vessel containing paint through a piece of rubber or gutta-percha *which removed the surplus paint.* (Page 137, folio 258 of Record.) He sometimes covered the wire with a thicker thread and two coats of paint thereon, and sometimes by a thread coveridg and a coat of paint, then another thread covering and a coat of paint.

He does not state in his testimony whether in these last two methods, he used a device for removing the surplus paint, but as the conductor was to be used for the same purpose in each instance, it is reasonable to presume that the surplus was removed.

The sole testimony as to the condition of the first coating of paint when the second covering of thread was applied, is found in Holmes' answer to the tenth interrogatory (folio 259, page 137) quoted in the opinion of the Court, which was that "the first coat was partially dried so as to keep its place, but would admit of an impression from the next covering of thread."

It is submitted that the mistake of the learned Judge arose from the inferences, which we think were not warranted from the testimony of the witness:—

(*a*) That the first coat of paint was in such condition and quantity when the second covering of thread was applied that, in the language of the Cowles patent, "the threads that are braided upon the paint force the paint into the first-braided covering, and at the same time the paint oozes through between the threads."

(*b*) That by the methods, as practiced by Holmes, the thread covering was *loaded* with paint, and that the methods were adequate for the purpose of filling the interstices and

pores of the thread with paint, in the substantial sense of the Cowles invention.

(*c*) That the Holmes wire was in fact non combustible.

This view is sustained by the affidavits of Latham, Greenfield and Holmes on motions for rehearing (pages 142, 143 and 146 of Record), who agree that the Holmes wire was inflammable, and that the paint was not forced into the interstices of the threads, that the surplus of paint was wiped off, and that it was some time before the second covering of thread was put on, the time depending upon the state of the weather, as the object was to have the paint dry for convenience of handling. The covering of the wire with thread was done at one factory (in Brooklyn) and the painting at another (in New York). See Holmes' affidavit, pages 146, 147, folios 277, 278; Latham, page 142, folio 270, and Greenfield, page 144.

It is to be borne in mind, as previously stated, that Holmes' object was to secure electrical insulation only, and that after having used the painted wire for some time he abandoned it for that which doubtless served the purpose equally well or better, to wit, the paraffine coated wire. (Ans. to Ints. 2, 7 and 8, page 117 of Record.)

In the opinion denying the motions for rehearing it is said (page 155, folio 297): "The case was decided upon the ground that no previous patent or method of insulation was an anticipation, but that, in view of the Holmes' system, as the same was understood, the Cowles process was not a patentable invention. The question now is whether the decision should be changed in view of the fact that the Holmes system, as he practiced it in burglar alarm wires, did not produce non-combustible insulation. The question is now, as before, that of patentable invention. It abundantly appears that the non-combustible insulator for inside electric lamp wires which Cowles gave to the public was practically a new and useful thing, but no one

can read the original record without receiving the idea that if Cowles can be considered the inventor within the meaning of the patent law, he is on the edge of the line which separates invention from mere improvement."

The opinion proceeds to refer generally to the prior state of the art, but it would seem apparent that it was the Holmes' system that turned the scale, and placed Cowles on the unfortunate side of the dividing line.

Now, the contention of the appellant is that paint *per se* is not non-combustible; that the prior art shows no electrical wire insulated with paint or other material, which was non-combustible under the heat of high tension currents—in short, no wire that could with safety to person and property be substituted for the Cowles wire.

It is perhaps true, that a wire, or a thread-covered wire, may be so thickly or heavily coated with paint as to be in a certain sense non-combustible, but it would be obviously incapable of practical use as an electric conductor, because it would be incapable of being bent or flexed, as it must be in practice, without at least cracking open the mass of paint, thereby at once defeating the very object of the covering.

The contention of appellant is clearly stated in the opinion of the Court, page 156, folio 298, that Cowles discovered that there was a non-combustible property in paint when applied as he applies it, which enables currents used in electric lighting to be employed with safety inside of buildings.

We have hereinbefore analyzed the prior patents and testimony of the prior state of the art, and we submit, with all due respect to the opinion of the learned Judge below, that by no *a priori* reasoning of one familiar with such prior art, would it have become known that any of the described methods would produce the practical results of

the Cowles invention. It required the inventive or creative operation of the intellect.

We have seen that the only conductor used for electric light currents prior to this invention was the paraffine coated wire, which was extremely dangerous for the purpose. Now, if it be so obvious a thing to produce the Cowles wire, it may be pertinently asked, why was it not before produced when it was so greatly needed, and known to be needed?

We have Mr. Edison, whose fame as a great and far-seeing inventor and expert, especially in the field of electricity, and particularly with relation to electric-lighting, who, it is to be presumed, was familiar with the state of the art, using the dangerous paraffine coated wire as the best to be had, until the Cowles wire entered the field, and so early as in May, 1881, he, Edison, thought he would be able to take five tons a week of the new wire. See Exhibit Cowles-Edison letter, page 69 of Record.

Attention is particularly directed to the testimony of Mr. Edison, as showing the surpassing value and utility of the invention and as affording a strong presumption of its novelty, and not merely "a skillful selection of one of a number of methods at the hands of the patentees."

The Record fails to show any prior use or description of paint for fire-proofing purposes for any conductor for electric lighting, or otherwise, nor does it show that it was in fact known that paint alone applied in any practicable way afforded a fire-proof quality; certainly not paint in combination with, or, so to say, incorporated with, inflammable thread, and we again submit that it amounted to a new discovery when Cowles found a way of so combining paint and thread with the wire as to give, so to say, practically a new quality or function to the paint, not apparent from its known constitution.

It is further submitted that this case does not come within the principle of *Pennsylvania R. R. Co.* vs. *Locomotive Safety Track Co.*, 110 U. I. 490, *Miller* vs. *Force*, 116 U. S. 22, and like cases; but rather, taking the view of the Court below that "if Cowles can be considered an inventor within the meaning of the patent law he is on the edge of the line which separates invention from mere improvement," within the principle of *Smith* vs. *Dental Vulcanite Co.*, 93 U. S., 495, as broadly stated in Walker or Patents S 40, p. 38, "When the other facts in a case leave the question of invention in doubt, the fact that the device has gone into general use, and has displaced other devices which had been previously employed for analogous uses is sufficient to turn the scale in favor of the existence of invention."

Admitting that paint had been used for certain special or limited purposes as a covering or part covering for conductor wires, and that pitch, bitumen and other inflammable substances had been used in connection with fibrous materials as an insulating covering, we contend that by the use of paint, as Cowles applied and used it, he produced a new and non-obvious result.

We refer in conclusion to a case, the facts of which and the reasoning of the learned Judge (BLATCHFORD) are in a measure applicable to the cause at bar—*Colgate* vs. *Western Union Telegraph Co.*, 4 B. & A., 36.

The Simpson Patent, on which the suit was brought, was for a conductor (wire) for electricity, encased in gutta-percha. Wire had been previously covered with gutta-percha, and it was well known that resins and gums were electric insulators, but it was shown that it was not known that gutta-percha was a non-conductor of electricity.

The Judge said:

"It is manifest that the gist of the invention is the discovery of the fact that gutta-percha is a non-conductor of electricity, and the application of that fact to practical use by combining gutta-percha, by the means specified, with a metallic wire, in the manner described, and then using the cable formed by such combination for the purpose of conducting electricity along the enclosed wire. The point of the invention is not the mere mechanical covering of a metallic wire with gutta-percha, as a mechanical protection from abrasion or injury from without, or for any purpose aside from a use of the covered wire as a conductor of electricity.

"The claim is valid, even though a metallic wire covered with gutta-percha existed before the plaintiff's invention, if it was not known that gutta-percha was a non-conductor of electricity and could be used to insulate the wire. The use by the patentee of the wire so covered to conduct electricity was not a double use of the covered wire, even though the covered wire existed before, nor was it a use of it for a purpose at all analogous to any use before made of it, if such prior use of it was not to conduct electricity along the wire, and if it was not before known that gutta-percha was a non-conductor of electricity, and could be used to insulate a metallic wire used as a conductor of electricity.

"It is further contended, for the defendant, that, as it was known that resins and gums, as a genus of articles, were electric insulators, it did not require or involve any invention, when gutta-percha became known, to cover wire with it, or insulate the wire. It is very easy for wisdom after an event to say that it was a natural conclusion that gutta-percha would be an insulator, from the known insulating properties of gums and resins generally. But the evidence in this case shows that, although gutta-percha was known, and the means of softening and manipulating it were known, many experienced men

engaged in the business of telegraphy groped about, experimenting first with one device and then with another, in fruitless efforts to secure a practical means of crossing water courses with lines of telegraph wires, until it was at length found out that gutta-percha was the needed insulator.

"Equally unsound is the view urged on the part of the defendant, that the use of gutta-percha instead of india-rubber, to insulate a wire, was a mere change of material, and an obvious substitution, and, therefore, not patentable. The cases of the door-knob, and the button, and the wagon reach, have no application to a case like the present. Those who were seeking a practically perfect insulator had india-rubber, and found it not to be what was needed. The present case is not merely one of producing a better or more durable article to attain the same result, nor is it one falling within the principle that a change involving only mechanical skill is not patentable."

It is earnestly submitted that upon the case as presented by the record, and for the reasons hereinbefore set forth, the decree entered by the Circuit Court was erroneous and that it should, therefore, be reversed with costs.

CHARLES E. MITCHELL,
JOSHUA PUSEY,
Counsel for Appellant.

EXHIBITS

Appellant's Exhibits

Complainant's Exhibit		Electric Wire,	introduced on page	15					
"	"	Cowles Patent	"	"	"	", printed on page	66		
"	"	Defendant's Wire	"	"	"	"			
"	"	Paraffine Wire	"	"	"	19			
"	"	Defendant's manufactured Electric Wire	"	"	"	20			
"	"	British letter	"	"	"	47	"	"	" 68
"	"	Specimens made according to British Patents	"	"	"	51			
"	"	Cowles' Wire No 2	"	"	"	57			
"	"	Paraffine Wire	"	"	"	"			
"	"	Cowles—Edison letter	"	"	"	60	"	"	" 69
"	"	Cowles—Brush Illustration	"	"	"	65			

Appellee's Exhibits

Defendant's Exhibit		File-Wrapper and Contents Cowles Patent	"	"	"	73	"	"	" 124
"	"	British Patents	"	"	"	98	"	in Addition to Record	
"	"	Bryant letter	"	"	"	100			
"	"	Reed Drawing	"	"	"	111	printed opposite p. 92 of Addition to Record		
"	"	Reed A. B. C. D (wire)	"	"	"	123			

144 U.S. 11

Office Supreme Court U. S.
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JAN 14 1892

Supreme Court of the United States,

OCTOBER TERM, 1891.

No. 165.

THE ANSONIA BRASS AND COPPER COMPANY

Appellant,

against

THE ELECTRICAL SUPPLY COMPANY.

Appeal from the Circuit Court of the United States for the District of Connecticut.

BRIEF ON BEHALF OF THE DEFENDANT APPELLEE.

CHARLES R. INGERSOLL,
MORRIS W. SEYMOUR,
of Counsel for defendants.

Hoggson & Robinson, Law Printers, New Haven.

Supreme Court of the United States.

THE ANSONIA BRASS & COPPER CO.,
Appellant,
vs.
THE ELECTRICAL SUPPLY CO.

Appeal from the Circuit Court of the United States for the District of Connecticut.

Brief for Defendant and Appellee.

HISTORY OF THE CASE.

This bill was brought in the Circuit Court of the United States of the District of Connecticut on the first Monday of September, 1884, alleging the infringement of certain Letters Patent of the United States, No. 272,660, dated February 20th, 1883, granted to Alfred A. Cowles for an improvement in insulated electrical conductors.

The method of insulating electrical conductors claimed by the patent consisted generally in the application of a

coating of fibrous material to the wire conductor and then a coating of paint thereon and then successive coats of fibrous material and paint in the same manner, for the purpose of rendering the insulation substantially non-combustible.

To this bill the respondent filed an answer denying the validity of the patent.

Upon the hearing of the cause in the Circuit Court before his Honor, Judge Shipman, the bill was dismissed, as will appear by pages 133–139 of the Record, for want of patentable novelty in the claimed invention.

After the rendering of this decision by Judge Shipman, a petition for a rehearing was filed by the complainant upon certain affidavits, for the purpose of showing that in the instance particularized by Judge Shipman where paint had been used by one Holmes as an insulating or protecting material, the second covering of fibrous material had been applied upon the interposed paint after a greater lapse of time than would be inferred from the statement of his testimony when first taken by the defendant.

Upon the hearing of this motion the defendant by its expert, John E. Earle, showed by experiments detailed by him, pp. 149–154 Record, that the wire prepared in the manner described in these affidavits of the complainant was as fully insulated and rendered non-combustible as when prepared by the method of the patent.

Upon this petition for a re-hearing after full argument Judge Shipman rendered a second opinion which is found

pp. 154-157 of the Record, also 35th Fed. Rep., p. 68, in which after a careful review of the whole case be summed up his opinion as follows:

> "Neither counsel nor expert really contends that Cowles discovered the non-combustibility of metallic paint or that he discovered that a fibrous article clothed with metalic paint was thereby enabled to resist the effect of heat, and that when heat was applied it had a tendency to char rather than to blaze. The strength of Cowles' claim of title to invention consists in the fact that he introduced an adequate and efficacious way of applying the metalic paint so as to make the covering thoroughly non-combustible.
>
> There was in my opinion no invention either in the selection of paint as a means of non-combustible insulation or in the process of applying the paint. There was no novelty in either the knowledge of the fact that the liquid material which is applied to the fibrous material should be applied so as to thoroughly saturate it or in the knowledge that the pressure of a second fibrous covering upon a wet and plastic covering tends to saturate each. There was no invention in the selection or ascertainment of the particular method by which the paint should be made to permeate the covering. Coverings of electric wire had been previously saturated with insulating material by the three steps which are named in the patent. It was a good way in which to cause the metallic particles of the paint to be diffused through the coverings and other ways might easily be selected which would accomplish the same general result
>
> As was said in the former opinion there was in the adoption of the patented method 'only a skill-

> ful selection of one of a number of methods at the hand of the patentee.' The present thorough presentation of the character of the Holmes' covering does not, in my opinion, change the result which was reached, because however beneficial the Cowles' wire is it was not an invention."

From the decision of the case by Judge Shipman upon this thorough examination, this appeal is taken and the same defence insisted upon as in the Court below.

COMPLAINANT'S PATENT.

An examination and analysis of the specifications and claims of the Cowles' patent, shows that it consists in a group of the following steps.

1. Applying to the wire to be insulated a jacket of fibrous material; that is to say, "a layer of cotton or other threads is placed upon the wire in the ordinary manner." Obviously this jacket may be braided about the wire or may be wound round it by any of the perferred methods long known and practiced in the art of insulating conducting wires.

2. Causing the jacketed wire to pass through a vessel containing ordinary paint.

3. Applying a second jacket of fibrous material in the same manner that the first jacket was applied.

4. Finishing the surface of the covered wire by pass-

ing it through any suitable mechanical devices as for example grooved pressure rolls, the language of the specification being "the braided covering is rendered even and consolidated by suitable means, such as one or two pairs of grooved rollers kk."

5. The number of layers of fibrous material are immaterial, the important thing being the intervention of common paint between the layers.

6. It is preferred to braid the second or subsequent jackets upon the paint when fresh, but the invention is expressly not limited to this by the statement in the specification: "*I do not limit myself in this particular as the paint may be dried or partially so*, before the next braiding is applied.

The specification states the prior art as known to the inventor at the date of his invention, but an examination of the File Wrapper and Contents as put in evidence, folio 231 to 251, pp. 124–133 of Record, will show that this statement was not in the specification, but was forced upon the patentee during the progress of his case through the patent office. This recognition of the prior art is as follows, folio 250 page 132 of Record.

> "I am aware that wire has been covered with braided threads, also that india rubber, asphaltum and similar materials have been applied to the covering either hot or cold, but one covering of such material was allowed to set or harden before the next layer of braided material was ap-

> plied. Hence the asphaltum or similar material was not forced in the interstices, and besides all of these substances ignite by the wire becoming heated, and fire will follow along upon the said covering."

This recognition of the prior state of the art not only does not in fact disclose the true state of that art, but the patentee had good reason to know that it did not. It is not a full statement of the prior art.

First. In that it does not recognize the common knowledge of paint as an *insulating material.*

Secondly, in that it does not recognize the common knowledge of paint as substantially a *fire proof material.*

Thirdly, in that, although it admits that certain insulating material, such as india rubber, asphaltum and other similar materials, had prior to the date of the Cowles' invention, been applied upon the coverings either hot or cold, it states that "one covering of such material was allowed to set or harden before the next layer of braided material was applied," whereas numerous patents, as we shall presently see, disclosed that a second braiding of thread had been applied upon the interposed insulating material as a part and parcel of one continuous operation,

and that this must have been known to the patentee, when this disclaimer was made, would seem to appear by the case of the *Western Electric Company* vs. *A.*

Copper Co., (the present complainant), 114 U

Mr. Serrell, the solicitor who took

and who is called by the complainants to testify as an expert now says, folio 38, page 22 of the Record:

> "Referring to the state of the art, as before known to myself and to the facts communicated to me by Mr. Cowles, the inventor, during the preparation of his application, it was old to make use of a fibrous covering to the metalic wire, and it was old to saturate that covering with water-proof material, such as for instance paraffine pitch, tar, resin in a melted condition, and also gutta percha, and also india rubber in a solution, and in some instances, even paint has been made use of. These substances have been used to insulate the conductor electrically so that the current passing along the wire might not escape by contact of the covering with the support or with any conducting substances."

and see fol. 41 p. 24

We submit that if the patentee had included in his disclaimer these admissions, and the facts which were made use of in the defense of the Western Electric Company case, which we have just referred to, the patent office could never have granted him this patent. Such admissions would have been destructive to his application.

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Mr. Serrell, the solicitor who took out this patent and who is called by the complainants to testify as an expert now says, folio 38, page 22 of the Record:

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For it is plainly based upon the assumption of the following facts:

(1.) That paint was not known at the date of his alleged invention as a non-combustible material.

(2.) That it was not known to be a material useful for electric insulation.

(3.) That no insulating material, whether paint or any other well known insulating material had been interposed between the two fibrous jackets, the second fibrous jacket being applied while the insulating material was in a green, plastic or unset condition.

Each of these three statements are, we submit, absolutely untrue in fact.

I.

Paint has always been known as a practically non-combustible material.

In fact this seems to have been conceded in the Court below. Judge Shipman says, near the end of his final opinion at the hearings before him, folio page 199, page 166 of Record.

"Neither counsel or expert contends that Cowles discovered the non-combustibility of metalic paint or that he discovered that a fibrous article clothed with metalic paint was thereby enabled to resist the effect of heat and when heat was applied it had a tendency to char rather than to burn."

The non-combustibility of paint is a matter of common knowledge and results from the constitution of paint itself. This is explained clearly by Mr. Serrell the complainant's expert who shows that the oxides and carbonates of lead of which ordinary paint is principally composed are both "non-combustible and non-conductors." Record folio 59, page 36.

Mr. Serrell says:

"The white lead being a carbonate is not subject to decomposition easily in the presence of heat and the atmosphere and practically it is not liable to change or combustion by the heat developed in an electric conductor by short circuiting or a resistence. The linseed oil in paint is to a certain extent combustible. The carbonate of lead is the material that is both non-combustible and a non-conductor."

"In the manufacture of zinc-white, the metallic zinc is actually burned in the presence of heat, and the atmosphere and the oxygen combining with the zinc forms zinc-white, and the zinc having been burned up once cannot be burned up the second time; hence the zinc-white is non-combustible."

Mr. Earle says: fol. 157, p. 90.

> "By terms 'metallic carbonates and oxides' is meant, as commonly understood, carbonate or oxide of lead, carbonate of lead being what is commonly called white lead, and oxide of lead being what is commonly called red lead, and either of which mixed with oil produces what is commonly called paint."

Oxides and carbonates are the results of combustion. They are themselves a resultant ash after all that is combustible connected with them has been burnt. And it is because of this very quality that paint has been used for this very purpose. This is particularly so in English Patent No. 3083 of 1873 granted to Wilkinson and which is found on pages 82 to 86 add. record, in which "white lead in solution" (which is paint) is shown as used to give to the telegraphic wire or cable a final exterior coating in order to render it both "fire-proof and water proof," folio 153, page 86 add. Record. The wire in this case being "especially applicable for land lines both overhead and under-ground."

II.

Paint has also been long known as a material for electric insulation.

This is conceded by Mr. Serrell, complainant's expert, folio 85, page 22 Record.

"It was old to make use of a fibrous covering to the metallic wire and it was old to saturate that covering with water-proof material, such for instance as parafine etc., * * * and in some instances even paint has been made use of. These substances have been used to insulate the conductor electrically."

Again Mr. Serrell says:

"66 Xq. If I understand your direct testimony correctly, you say that prior to the invention of the Cowles' Patent in suit, paint prepared of metallic carbonates or oxide mixed with some fluent substances, had been used in connection with fibrous coverings on wire for the purpose of insulating it electrically? Am I correct in so understanding?

"Ans. Paint had been used upon the outside of one layer of fibrous material as a protection to the fibrous material.

"67 Xq. Was that for the protection of the fibrous material only?

"Ans. Primarily for the protection of the fibrous material, but the paint being also a non-conductor, aided in the insulation. * * * *

"69 Xq. Do you cite that quotation in support of your answer to Xq 66?

"Ans. Generally I was also aware that paint had been used upon the outside of one layer of fibrous material by Mr. Cowles before making the present invention."

And it is completely established by the proofs of the record that Edwin Holmes so used paint as early as 1860, some of which so insulated wire at the date of his testimony he swore was still in use, Record pages 117, 118, folio ~~250~~ 216.

In fact, upon the re-hearing of the case the complainant adopted Mr. Holmes as their witness and conceded his prior use of paint as an insulating material. Record 146, folio 276. The testimony of Mr. Charles Williams, Jr., is to the same effect, Record p. 118, folio 220. Thomas L. Reed states the same thing, p. 110, folio 202; also testimony of Mr. Thomas S. Hood, folio 212, p. 115 Record.

III.

It had also been of long practice before the Cowles' patent to apply the second fibrous covering upon the interposed insulating material while such material was in a wet, plastic, or unset condition.

This also is substantially conceded by Mr. Serrell, the complainant's expert, in the testimony already quoted. He says it was old to saturate the fibrous covering with water proof material and that this filling of the pores was known to complainant when the patent was assigned to it by the patentee Cowles (who signs the present bill as the complainant's secretary) is evident by the case already cited of the Western Electric Co. against the present complainant, 114 U. S., 447.

And so says Judge Shipman, folio 299 p. 187

> "Coverings of electric wire have been previously saturated with insulating material by the three steps which are named in the patent."

It is also established by numerous patents in the present record.

English Patent Brown & Williams, No. 12,991, of 1850. add Record folio 5, page 2. Earle's testimony, Record folio 169, page 96, Mr. Earle says of this Patent: "It describes a method of covering wire for electrical purposes which consists in the application of several coverings of fibrous material having combined therewith insulating material applied during the process of covering, and so that the coverings of fibrous material are laid while the insulating material is in a green or unset condition."

English Patent, John Wallace Duncan, No. 906, of 1853, add Record folio 22, page 12. Earle's testimony, Record folio 170, page 96. Mr. Earle says of this Patent: "There is described and shown a method and apparatus for insulating conductors which consists in applying a layer of fibrous material, a layer of insulating material, and a second layer of fibrous material upon the insulating material before the said insulating material is set or hardened."

English Patent to William T. Henley, No. 1126, of 1864. In this Patent, folio 89, pages 50–51, add record, the inventor says: "I am aware that attempts have been made before to insulate telegraph wires by alternately covering with cotton or silk, and resinous matters but owing to each covering having been made a separate operation the work was so imperfectly done that the covering was useless as an insulator," and the Second claim of the Patent.

folio 91, page 53, add record, is as follows: "2nd. The insulating of the conducting wires with one or several coatings of composition and fibrous materials at one and the same time as hereinbefore described and illustrated."

English Patent to Felix Marie Boudoin, No. 933, of 1857, add Record folio 44, page 19. This patent was construed by this Court with others in Western Electric Co. *vs.* Ansonia Co., and the Court said: "They all three describe the compressing of the wax, parafine, or ~~other~~ bitumen ~~material between~~ coatings of a wire covered with the fibrous material so as to obtain the same result, namely the insulation of the wire."

A number of other Patents to the same effect are cited by Mr. Earle in his testimony at folio 170, page 96, Record. The only criticism made by Mr. Serrell, the complainant's expert, upon these Patents cited by Mr. Earle and his testimony regarding the same is: "That the insulator is not in any respect fire-proof." He does not deny that the insulating material was in a fresh or soft condition when the fibrous covering was braided or applied upon it.

See fol. 41 p. 24 Record.

IV.

The mechanical process by which the Patentee claims to cover the wire with successive coats of fibrous and insulating material is also old and well known.

Numerous Patents including those already referred to show this and we do not understand it to be denied by the

complainant's expert. These Patents are described by Mr. Earle in his testimony commencing at folio 128 page 74, Record. We particularily call attention to the drawing (Fig. 3, page 95,) accompanying the English Patent, Willliam T. Henley, No. 1126, of 1864, folio 84, page 46, add. record, as showing this mechanical process in detail, and also to the drawing Fig. 1, page 116, accompanying Englis'. Patent to George F. James, No. 133, of 1880, folio 114, page 62, add. record, and also to the exhibit Reed drawing, page 164, add. record.

V.

It results from the foregoing examination of the state of the art that the claimed invention of Cowles is without patentable novelty.

I. It is beyond question that Holmes, as early as 1860, practiced in the insulation of electric conductors the entire process claimed by Cowles, unless it is essential to that process that the second coat of fibrous material shall be applied to the paint when the paint is in a fresh or wholly undried condition.

(1.) But this limitation is not essential to the invention as claimed by Cowles. Although he chose to limit the claims of the Patent in that respect, yet the body of the specification shows that this was intended only as a preferable mode of practicing the claimed invention, a more

thorough mode, and therefore only better in degree. The specification concedes that there is no patentable difference between applying the fibrous covering to the paint "before it dries or sets" or after it has become "dried, or partially so" The invention is claimed to be there in either case.

(2.) And the proof is that there is no special merit or advantage in the preferable method claimed. Mr. Earle's experiments are conclusive upon this point, page 149, folio 285, Record. Nor, on the other hand, does the Record disclose any such merit or advantage beyond the statement of the patent itself, which in view of its willful concealment as to the state of the art, is not entitled to any presumption of credit.

(3.) Nor is the Holmes anticipation impaired by the fact that the process was used by him for purposes of currents of electricity of low tension where there was no probable danger of combustion from the electric current. Holmes is presumed to have had the common knowledge that paint was not only an electrical insulator but a fire-proof electrical insulator. And he must also be presumed to have intended his insulated fire-proof wire for all the uses to which it might be applied. When in the progress of the art it became necessary to use his wire for purposes of a current of higher tension everything was there to render it suitable to such purpose. He certainly must have had the common knowledge that under certain conditions heat is developed by the electric current.

(4.) But if the patentee's statement of his invention is to be ignored and the application of the fibrous coating to the paint in a fresh and unset condition is to be held essential to the claimed invention, there could not have been anything that can be called patentable invention in Cowle's determination to make such application a part of his process. For, as we have already pointed out, he must have known that this method of applying and combining the insulating material had long been practiced, and particularly had good reason to know that there could be nothing that was patentable in any such step of the process in view of the case heretofore cited in 114 U. S., page 447.

II. But independently of the proof that paint had been long used, for the purposes of insulation and protection in the manufacture of electric conductors, the proof is conclusive that all that was needed to be done in the then state of the art by Cowles, or any other man, to produce an electric conductor which should be proof against the combustion resulting from the resistance of a high tension current was to substitute, in the well known and long practiced process of making electric conductors for low tension currents, a non-combustible insulating material in place of a combustible insulating material.

And paint was at hand as such substitute, for it was known to be an insulating material, serving the same purpose as the paraffine, etc., but at the same time, fire-proof.

This protective capacity of paint is due to the carbonates or oxides of metal it contains. Cowles could not

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have discovered that paint contains these carbonates and oxides or that such metallic substances are incombustible. No invention was possible there. It was simply on his part a selection of what he considered the best one of many known insulating substances to meet a new occasion, that is, to place upon electric conductors when the current upon such wires was increased in tension by the use (in the progress of the art) of dynamo machines.

Nor did he discover any novel method of applying this paint so as thereby to produce any new and distinctive result. It was combined with the fibrous material by the same process, by which other fluid or plastic insulating substances had long been combined with such fibrous material. When so applied it had no other result than that which was due to its metallic composition. It was non-combustible after it was applied because it was non combustible before it was applied.

It is needless to cite the repeated decisions of this court to show, that upon this view of the complainant's case, the patentee has done nothing that can be dignified as patentable invention. They have received recent recognition in *Consolidated Roller Mill Co.* vs. *Walker*, 138 U. S., 124, *International Tooth Crown Co.* vs. *Gaylord*, 140 U. S. 55. *Burt* vs. *Evory*, 133 U. S., 349. Mc Clain vs. Ottmann 57 Off. Gaz 1179. Adams vs Bullain Co. 57 O.G. 1288.

In fact, the complainant's case, as finally presented in the Circuit Court, upon the motion for rehearing, was brought to this—that the patented invention consisted in "the confining and pressing into the fibrous covering of

the solid material of the paint, so that such fibrous covering is filled and loaded with as much of the metallic oxides or carbonates, as is necessary to render the fibrous covering practically fire-proof." Opinion, fol. 298, p. 156.

That is, the work of combining the paint with the fibrous material was to be *thoroughly* done.

This would seem to be obvious to any skillful workman in the art, without the aid of any information from outside. But the information that this "filling" and "loading" and "saturation" and "permeation" of the fibrous material, by the insulating material had been practiced was common and abundant, as has been shown.

There is no suggestion in the record why this should be any less obvious in the case of the employment of fire-proof insulating material than in the case of water-proof or any other kind of insulating material. But the record does show that it had been practiced in the one case as in the other. The English patent, Wilkinson, No. 3083, *Add. Rec.* fol. 148, p. 83, shows that after the rope or cable had been "run through a bath of white lead in solution to give it a final exterior coating, in order to render it both fire-proof and water-proof," (fol. 149), "they are placed in a bath or tank containing hot water or steam, and then drawn through dies by pressure, in order to compress and thus fill up the open pores of the ropes, strands or cables," (fol. 153). See also West Patent, No. 2321, Add. Record, fol. 119, p. 66, where the "fibrous material is *saturated* with a composition consisting of some one or

more of the metallic carbonates or oxides, mixed with some of the fixed oils." "For the purpose of preserving such fibrous material and causing it more effectually to protect the insulated wires or conductors from injury." Also Highton Patent, 1872, No. 2547, fol. 143, p. 80, where a "coating of boiled oil and red lead" is employed "to fill any minute pores in the insulator."

And the conclusion of Judge Shipman in this respect, (p. 157), is unavoidable.

> "There was no invention either in the selection of paint as a means of non-combustible insulation or in the process of applying the paint."
>
> "There was no invention in the selection or ascertainment of the particular manner by which the paint should be made to permeate the covering. Coverings of electric wire had been previously saturated with insulating material by the three steps which are named in the patent."

C. R. INGERSOLL,

M. W. SEYMOUR,

Of Counsel for Defendant.